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KANSAS CITY

REVIEW OF SCIENCE AND INDUSTRY,

A MONTHLY RECORD OF PROGRESS IN

SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VI. APRIL, 1883. NO. 12.

PHILOLOGY.

DIALECTS OF BOLIVIAN INDIANS.

A Philological contribution from material gathered during three years residence in the Department of Beni, in Bolivia.

EDWIN R. HEATH, M. D.

In the northwestern part of Bolivia, along the rivers Beni, Mamore and Yacuma, there are various Indian tribes, some civilized, others still savage, each tribe having its own distinct language, even though living side by side, having constant intercourse and intermarrying. The civilized tribes, living on the Mamore and Yacuma Rivers, are the Cayuaba, Moima, Canichana and Trinitaria. The first named live in and about the village of Exaltacion. They are physically well formed, although short in stature, seldom exceeding five and a half feet, while the Mobimas, who live at Santa Ana on the the river Yacuma, twenty-nine miles further south, seldom ever are under six feet. The Canichanas resemble the Mobimas, in stature but differ in form, being lean and bony. The Trinitarias partake of the peculiarities of the other three tribes. The two last named reside at San Pedro and Trinidad, still further south of the others. The Mobimas have a preference for agriculture and stock raising. The Canichanas make the best cartmen, while the Cayuabas, Canichanas and Trinitarias make excellent boatmen. On the east side of the Mamore, from Exaltacion as far north as the mouth of the river Guapore or Itenez, are found the wandering tribe of Houbarayo savages. Their name is a terror to those who ascend and descend the river.

Many a paddler has ended his voyage by an arrow from their ambushes—nor does the owner of the boat escape them always. Opposite them, on the west side of the river, are the Chacobo savages, but extending further north, even to the river Beni. At one time they were a part of the Cayuaba Mission. Late years they have returned to their old barbaric ways. Ascending the Madiera River from San Antonio, in Brazil, the head of steamboat navigation the traveler has to guard himself from the Cangaparangas, who shot and wounded Peter Collins, one of the brothers who had the Madiera and Mamore R. R. in contract; from the Carapuna and on the Mamore River from these two savage tribes.

Well do we remember the anxious scrutiny of every bush and deeper shaded point. Very few are the stoppages when once south of the Guapore, the Indians willingly paddling from 1 A. M. to 11 P. M. Often have we seen them sound asleep, yet never missing a stroke of the paddle, even though they make from forty-five to fifty strokes per minute, all dipping their paddles in unison. One night, having camped on the Chacobo side, after supper, the fires being extinguished, we all lay down for a good sleep. About 1 A. M. the crackling of a twig and sound of stealthy steps aroused the camp and all as quickly and noiselessly as possible took to the boats and paddled to the other side. Turning a bend in the river we came suddenly on a camp of the Houbarayos who were spending the night there. Taken by surprise they had no time to make an attack. 'Tis a question, which were the most frightened, they or our boatmen. The steersman immediately turned the boat away from the bank and it needed no order to make each paddle do its best. Reaching shallow water, some of the boatmen jumped overboard and held the boat till morning, changing duty in the water; as one became exhausted another took his place. Meanwhile we kept a close watch with our arms ready. As daylight came our danger passed, as none of these Indians will attack openly where there is any danger to themselves. At another time while ascending the Mamore with the two Indians and a small boat with whom and which the author had made the exploration of the river Beni, hugging the eastern shore to escape the currents, a voice as if some one was hallooing for assistance was heard. Carefully scanning the opposite bank, for some time, with powerful field-glasses, a naked Indian (Chacobo) was seen standing alone on a bit of sand-bar at the edge of the river. Besides calling he made signs for us to cross over to him. Seeing we paid no heed to him he ceased calling when there descended the bank from their ambush some twenty-five others each with their bow and arrows.

On the river Beni, between 11° and 12° south latitude, are the small tribe of Pacavaras. There are but four families left, consisting of from eighteen to thirty individuals each. Their skin is almost white, bodies well formed, and the women very handsome, features more Caucasian than Indian. They pierce the septum of the nose and thrust feathers through it from each side making them look as if having heavy mustaches: The women wear small flaps or aprons. They attend to the planting, cooking, and every day go to the woods for their fuel, including a wood which, once set on fire, never goes out till consumed, even though cut

green. With this, they build a fire under their hammocks, the smoke of which protects them from the sand-flies and mosquitoes, while they loiter away the time, one in each end of the hammock with their feet hanging out each side as represented in Orton's Andes and the Amazons, a position often criticised as impossible. They practice polygamy, every man having as many wives as he can provide meat for.

On the river Madidi, a few miles above its junction with the Beni, is the mission of Cavinas—about seventy individualls comprise the mission. Nearly every year they suffer loss from wandering cannibal tribes, probably the Araunas who live on the banks of the river Madre de Dios north and west of them. That the Araunas are cannibals is beyond a doubt. At one of their visits to the mission one of the men went out to hunt, but returned empty handed, whereupon he went up to his wife, who was nursing a child, took it by the feet, dashed its brains out against the earth and cast the body upon the embers. When done, mother and all sat down to the feast. One could readily believe them to be cannibals, as a more gaunt, ugly, small formed tribe is seldom seen. They wear the hair long and go naked and are greatly feared by the Pacavara and Cavinas Indians. The Cavinas Indians use the Tacana language. In latitude 14° S., some twenty miles west of the river Beni is the village of Tumupasa and, northwest eighteen miles, that of Ysiamas. The former is the village where the civilized Tacana Indians live, the latter that of the uncivilized ones. Rumor says, they, having by chance found a stone bearing a remarkable resemblance to man, accepted it as deity and yearly, during the dry season, assemble there and pass a few days feasting, drinking and dancing. What their ceremonies are, if any, is kept a secret.

Opposite them, on the east side of the Beni, and some twelve miles from the river is the little town of Reyes. Here the Maropa tribe live, probably related to the Tacanas as the Portugese are to the Spaniards. The Maropas are a well formed and generally intelligent people, there being among the females many beautiful forms and faces.

Some forty miles up the Beni is the mission of Muchanes; beyond that Santa Ana; and just above the junction of the rivers from Cochabamba and La Paz, (forming the Beni), and on the former, that of Covendo. These are composed of Mosetena Indians. Their language is Frenchy in its pronunciation.

Falb, the German scientist, returning to La Paz from a visit to these missions announced that he "had found the origin of language." The women of all these civilized tribes do their own spinning and weaving, in which they become experts.

Their spindle is a small stick made of black palm pointed at both ends one of which is thrust through leather about a half inch. Seated on the ground with the left leg double up, the leather end is inserted between the large toe and the one next to it and the stick is then rolled down the right thigh or along a stick of wood prepared expressly for that purpose. Many of the old women have the skin on the thigh thick like the soles of their bare feet. As soon as a child is born it is plunged into cold water. Among the Maropas, as soon as the mother

is well through with her parturition the father of the child goes to bed and the mother has to wait on him as if he were the one who had given birth to the child. If very sick they have their coffin made and placed in the house so as to be ready when needed.

While in Santa Ana we were called to see a very sick Mobima chief. He resided in the country, but preferring to die in the village he had sent the measure for his coffin ahead. While examining the patient a man entered and to our surprise began to measure him. Comparison of his measurement with a string he held in his hand gave him to understand that the coffin he had just made was too short, upon which, he had supplicated the sick man to excuse his mistake and oblige him by not dying yet for an hour, as by that time he could rectify the mistake. Wait! was his parting word as he ran out of the house to his workshop, and to his great satisfaction as he returned with the coffin, he found his chief still alive. All these civilized tribes are very cleanly as to their persons and dress.

To this article is appended a comparative vocabulary of languages. The words selected are from the 211 words adopted by the Smithsonian Institution. Care has been taken to perfect the words so that they may be of use to travelers and persons studying languages. The Mobima idiom was first obtained from the Indians themselves and then read to Mrs. Cornelia Serabia de Suarez, an educated lady, who corrected the words, spelling and meaning of many.

The Canichana was corrected by Don Hugo Boger, a German and fine linguist, long resident there. The Maropa by Mrs. Fetterman, a Bolivian lady who learned it as her native tongue. The Tacana and Mosetana by the Padres of the missions. The sounds of the vowels and letters are after the rules of the Spanish language. The foot notes will assist one to understand them. It will be seen that there is a great similarity between the Maropa and Tacana idioms. The Maropas have many words that have significations widely different. Etra means bone and also hair. Biya means a louse, wasp or urine. The Pacavaras count by doubling into the palm of the hands the thumb and fingers repeating the word nata as each is moved till the last, when they say echasu. Pointing to each toe in succession and repeating nata, echasu, they count to twenty. Further numeration is made by repetitions of the same twenty counts. The wanting numerals of the other tribes are made by using the Spanish.

Don Francisco Keller in his "Amazon and Madeira Rivers," gives a short comparative vocabulary and Orton copies it, but they have greatly been misled by some one, as reference to this vocabulary will prove. Keller was in Exaltacion and Trinidad but a short time. The author spent two years carefully perfecting his work.

ENGLISH.	LIVING BESIDE THE RIVER MAMORÉ.			LIVING BESIDE THE RIVER BENI.			
	CANICHÁNA.	CAYUÁBA.	MOBÍMA.	MARÓPA.	MOSETÉNA.	PACAVÁRA.	TACÁNA.
Man.	Hio-chá-ma.	Me-yé-se.	I-ti la-qua.	Dre-ja.	Zoñ-i.	Tsé-que.	Dé-ja.
Woman.	Hui-qui-gá-ue.	Te-na-ni.	Cué-ya.	Á-nu.	Phen.	Yu-sá-bu.	Á-no.
Boy.	Yi-mi-lá-ni.	Mû-mi.	Di-chí-e.	Dre-já-ve.	Na-nat, Phañet.	O-mi-bá-que.	Ca-na-ne.
Girl.	Qui-coj-que-re-jé.	Ma mi-to-ra-ni.	Tor-co-cia.	Pu-ná-ve.	Ná-nas. [ta-na).	Yó-sa.	E-pú-na.
Infant.	Yem-i-la-chú-chu.	Ma-mi-to-ra-ni.	Ta-mí-ba.	E-ja-ná-na.	Na-nat (ichan-qui-	Tís-ti-a-ni-á-na.	Ca-na-ne-chí-di.
My Father (said by Son).	Eud-dhí-ti.	E-ra-pá-pa.	U-co-pá-a.	Qui-tá-ta.	Yet-chi-mú-mu.	Pa-pa.	Re-ma-ta-ta.
My Father (said by Daughter).	Eud-dhí-ti.	E-ra-pá-pa.	U-co-pá-a.	Qui-tá-ta.	Ye-si-mú-mu.	Pa-pa.	Re-ma-ta-ta.
My Mother (said by Son).	Eud dha-na.	E-ra-pi-pi.	Ines-má-a.	Qui-cu-a.	Yet-chi-ze (ño-ño).	Ca-i.	Que-ma-quá-ra.
My Mother (said by Daughter).	Eud-dha-na.	E-ra-pi-pi.	Ines-má-a.	Qui-cu-a.	Ye-sí-ze.	Ca-i.	Que-ma-quá-ra.
My Husband.	Eu-coh-ti.	A-ra-ti-ri.	Uco-ál-hua.	Qui-i-á-ve.	Yet-chi-uént-chi.		Que-ma-yá-vi.
My Wife.	Eu-coh-ti.	A-ran-ya-to-nû-[ni.	Ine-ál-hua.	Qui-e-vá-ne.	Ye-se-phén.		Que-ma-e-quá-ni.
My Son (said by Father).	E-ma-to-jo.	A-na-chi-ró-mi.	Uco-mách-ni.	Qui-em-bá-qua.	Yet-chi-á-na-mu.		Que-ma-em-ba-mi.
My Son (said by Mother).	E-ma-to-jo.	A-na-chi-ró-mi.	Uco-mách-ni.	Qui-em-bá qua.	Ye-si-á-na-mu.		Que-ma-em-ba-mi.
My daughter(said by Father).	Eu-có-ro.	A-na-chi-ró-mi.	Ina-mách-ni.	Qui-em-bá-qua.	Ye-si-á-na-ñe.		Oni-ba-qua-pú-na.
My daughter(said by Mother).	Eu-có-ro.	A-na-chi-ró-mi.	Ina-mách-ni	Qui-em-bá-qua.	Ye-si-á-na-ñe.		Oni-ba-qua-pú-na.
My elder brother.	E-mat-to-ui.		Á-cai.	Bé-tri. (1)	Yet-chi-vó-git.		Que-ma-o-ní-ci.
My younger brother	E-mat-tsu-i-mam-[bus-u-li.		Á-na.	Chin-tri.	Yet-chi-vó-git.		Que ma-coú.
My elder sister.	[abh.		Á-cai.	Drún-dru.	Ye-si-vo gis-ot chi.		Que-ma-dú-du.
My younger sister.	Eu-cau-la-mat-an-Eu-cau-la-mam-bu-[vi-u-li		Á-na.	Lá-na.	Ye-si-va gis-ot chi.		Que-ma-tó-na.
An Indian.	Hi-hur-cú-na.	Indio. (Spanish).	Indio. (Spanish).	Indio. (Spanish).	De-re-cañ-tchi.		Indio. (Spanish).
People.	Ach-kún-ti.	Me-yé-se.	Cûi-é ne.	Dri-a-ni quá-na.	Bo-yén-ye.		En-drá-ni.
Head.	Ni-mu-cúkh.	Gua-na-quâ-na.	Ba-quá-qua.	E-chu-ja.	Hu-tchi.		E-chu.
Hair.	Eut-chokh.	Tá-tob.	Ri-sa-quá-qua.	E-tra.	Yim.	Vo.	E chu-é na.
Face.	Eu-cokh ena.	Na-rán-na.	Mó-ran.	Em-bu.	Yé-ya.		Ém-bu.
Forehead.	Eu-shi-ti-daû-le.	Na-rá-na.	Bé-ran.	Em-má-ta.	Á-pi.		E-má-li.
Ear.	Eu-co-mé-h.	E-na-jen-gí-cui.	Lo-tó-to.	E-sha-cué-na.	Choñ.	Pas-qui.	E dá-ja.
Eye.	Eu-tókh-e.	En chá-co.	Tsó-ra.	E ta-chún-dru.	Ve (plural vein).	Huć-ro.	E-trá-drún-dru
Nose.	E-eb-je.	Na-hau-vé-o.	Bá-chi.	É-vi.	Hey.	Re-quí-ri.	E-vi-é-ni.
Mouth.	Euch-é-ne.	En-di-á-chi.	Cuá-na.	E-quá-tra.	Chó-o.		A-qua-tri.
Tongue.	Autsch-á-va.	Na-yí.	Ruch-lan.	E-á-na.	Nem.	Já-na.	E-á-na.
Teeth.	Eu-hûti.		Söich-lan.	E tré.	Mon-yín.	Tsé-na.	É-tre.
Beard.	Eut-chá-ga.		Chus-ca-tin-ca-clan.	Eñe-sá.	Ye-tí.	Cué-ni.	Qué-da.
Neck.	Eu-rí-ya.	Da-bu-ró-ra.	Huó-ro-ca.	E-ti-pí.	Tej.	Te-to ra.	É-tí-pi.
Arm.	Eu-rip-ha.	Nan-yau.	Bó-san.	Em-baí.	Se úñ.	Po-yá-nu.	E-búe.
Hand.	Su-té-h-li.	En-dá-dra.	Chó-pan.	Em-e.	Uñ.		É-ma.

ENGLISH.	LIVING BESIDE THE RIVER MAMORÉ.			LIVING BESIDE THE RIVER BENI.			
	CANICHÁNA	CAYUÁBA.	MOBÍMA.	MARÓPA.	MOSETÉNA.	PACAVÁRA.	TACÁNA.
Fingers.	Eu-o-cle-uts-é me.	En-dá-dra.	Dimp-pan.	Em-e-chû-ja.	Chi-ri-jf-ri.		É-ma.
Thumb.	Eu-o-cle-uts-é-me.	En-dá-dra.	Dimp-pan.	Em-e-chû-ja.	Chi-ri-jf-ri.		É-ma-chû-ai.
Nails.	Eu-ra-ca-tó-h.	Do-quí-ra.	Cho-rín-pan.	Em-e-tí-chi.	Pa-tchi-ni.		É-ma-tí-chi.
Body.	Eu-hei-e-tó-io.		Lo-bá-ban.	E-á-mi.	A-tsa.		E-qui-ta.
Chest.	Eu-nact-si-dan-ti.	E-na-ja-cá-e.	Be-rá-ran.	E-chén-tru.	É-fe.	Shi-pá-ti.	E-tré-du.
Belly.	Em-an-ca-ar-ëû.	E-na-na-ca-bi.	Tso-dó-be.	É-só.	Vó-co.	A-tóc-na.	É-tu.
Female breasts.	E-e-mé-ni.	A-na-má-mi.	Tsá-jan.	A-tru.	Ta-chi ni.	Chó-cho. (1)	Á-tru.
Leg.	Eut-chó-ta.	E-na-ji-ré-ra.	Di-nó-jan.	É-tá.	Yu.		E-ti-dá-da.
Foot.	Eu-ajts. [Il.	E-nár-je.	Rí-san.	E-vá-tri. (2)	Yu.	Tá-e.	E-quá-tri.
Toes.	Eu-qui-chi-un-at-au-		Din-pó-jan.	E-va-tri-ti-chi, (toe-	Chi-ri-jf-ri.		E-qua-tri-ri-tra-na.
Bone.	Ni-mak-hti.	Na-ra-quí-yi.	Nûn-i.	E-trá. [nails).	Yiñ.		É-tro.
Heart.	Eu-ni-má-ra	Na-ra-cá-je.	Jas-la-huan-dra. (1)	Ma-su-mû.	Cot-chi.		Ma-sú-mo.
Blood.	Eugh-ab.	Da-ta-ru-a.	Don-i.	Á-mi.	Cho-sé		Á-mi.
Town, village.	i-púb-lo.	En-ta-ru.	Ló-los.	É-jun-tré.	Bo-yén-ye.		E-jú-de.
Chief.	Eu-tí-shi. (casique).	Casique. (Spa'h).	Casique. (Spanish).	Casique. (Spanish.)	Mo-chó-ye.		Casique. (Spanish).
Warrior.		Na-chû-mi.	Já-rra.	Ja-ma-ji-tf-pu-ji. (3)			
Friend.	Eu-co-pan-li-na.	In-yé-ca.	Al-dra.	E-pe-ré-je.	Ñá-pu.		A-pa-ré-je.
House.	Nit-cojl.	Casa. (Spanish).	Dró-ya, (when occu-	E-tai.	Á-ca.	So-bo.	Ej-tej.
Skin-lodge.			[pied, "As-ña").				
Kettle.	Nim-û-da.	To-ren-dû-to.					Có-to.
Bow.	Eu-que-sin-to.	Ran-pu.	Tan-i-lo.	Pi-zá-trú-e. (z-th).	Co-in-ye.	Car-ni-á-ti.	Pi-sa-tri.
Arrow.	Eus-cû-ra.	Da-bí-hí-qui.	Jur-pa-huan-di.	Pi-zá. (z-th).	Yg-me.	Pi-a.	Pi-sa.
Axe—hatchet.							
Knife.	Neor-caab.	An-da-tuár-e.	Ca-chí-ru.	Cu-chi-lo.			
Canoe.	Ni-tu.		Jû-be.	Cu-am-bá.	Pó-ne.	Nû-ti.	Cuá-bua.
Tobacco.	Ni-cu-mú-cu.	Yú-pa.	Yu-má-res.	U-ma-za. (z-th).	Cos.	Rom-ui.	U-már-si.
Sky.	Eu-cu-neo-tao-li.		Ven-dra.	Em-ba-qua-pa-chá.	May-ye-si-yé-che.		Buey-ú-pa.
Sun.	Ni-coj-li.		Tí-no.	I-sje-ti.	Tsuñ.	Huá-ri.	I-ré-ti.
Moon.	Ni-mi-lau-e.		Yé-che.	Ban-trí.	Yvúa.	O-si.	Bá-di.
Star.	Ni-có-ma.		Di-rin-qua.	Bu-a-ná-vi.	O-ni-ta.		E-rú-jai.
Day.	Neo-o-cu-li.		Jej-mas.	Trí-ne.	May-ey. (1)		Trí-ne.
Night.	Ca-qui-tí-ji.		I-mai.	A-pu-mé.	Yo-möi. [ing).		Li-za. (z-th).
Morning.	A-mar-u-im.		Trrû-bûi. [mid-day.	Maí-ta.	Pa-min,(early morn-		Ma-ta-chu.
Evening.	Chu-at-ji.		Hua-lai-lu. Chon-ci	Tri-ne-quá.			Tri-ne-tí-a.
Wind.	Neurajábhn.		Pó-mo.	Bé-ni.	Pi-tíg-ti.		Bé-ni.
Thunder.	Cnaan-er-em.		Yam-pa.	Tí-ri.	Pi-rig-ri.		E-ti-ri-á-ni.
Lightning	Nco-gat-hi.		Tam-si.	Ji-li-ji-li.	Phen-phen		Tse-ru-tse-ru.
Rain.	Ni-ná.		Lu-ti.	Nai.		O-i.	Nai. [embers.)
Fire.	Ni-chu-co.		Vûé-e.	Cuá-ti.	Tsi.		Quá-ti-(Qua-tidoreda
Water.	Nih-tji.		Tó-mi.	Yû-vi.	Oz-ñi.	Jé-ne. (2)	É-á-ve.
Ice.					Jé-tís.		E-á-na.
Earth—Land	Nich-ich. (German).		Tla-cámp-ba. [er.	Mé-tri.	Ac.		E-na.
River.	Nih-cug-u-jú.		In-qua. (Mamoré riv-		Yn-ca.		
Lake.	Nih-sip-h.		Pou-lo—Tolin-lo. (2)	Bai.	Zí-que.		Bai.
Prairie.	Nik-sháva.		Ro-i.		Y-pán-ye.		Nuts-á-ni.
Hill—Mountain.			[Forest. [Isle. (3)	E-mí-na.	Me-que.		E-ma-ta.
Island.	Ni-schu-ám-choj.		Cham-mo-paich-len.	Isch-á-pu-pu.	Pot-cho or Chet-cho.		E-da-pú-pu.

Stone—rock.	Ni-cum-tshi.	Chám-pa.	Tu-má.	Mij.	Tó-mo	Tñ-mu.
Salt.	Neu-lû-cu.	Ndo-yon.	Bâ-no.	Ye-co.		Bâ-nu.
Iron.	Ni-hi-úr-u.		Pe-a-má.	[the forest].		
Forest.	Ni-scu.	Co-ó-mo.	Hay-jin-tru.	Dé-re, (Derecañ in		E-jí-je.
Tree.	Ni-yi-ga.	[wood].	A-qui.	Tsoñ.	I-vi.	Á-qui.
Wood.	Ni-pa-ti-huá-re.	Co-ó-bos. (Co-ó—fire-	A-qui.			Ei-na.
Leaf.	Nim-tijl.	Lo-ran-qua.	E que ná.	Chalñ.		
Bark.	Nim-ar-ar-ih.	Tso-bén-qua.	Em-bi-ti.	Z-pi. (z-th).		E-vi-ti.
Grass.	Nim hu-gu.	Mo-ás-qua. (4)	E-á-ji.		Tsé-qui.	Nûts-a.
Maize.	Ui-tju.	Quás-tá.	Shí-je.	Di-je.		Di-je.
Squash.	Ni-tza-hajl.	Va-ris.	Jé-mi.	Cho-bo.	Na-mi.	Jé-nu.
Flesh—meat.	Ni-huá-ca.	Hua-ca-to-da.	E-á-mi.	Chilrs.	Chas-pa.	Aí-cha
Dog.	Ni-pao.	Paco.	Pa-cu.	A-cho.		V-chi.
Bear.		Ba-na-ma,(ant bear).	A na, (ant bear).	Un-ut-chi ne. (2)		
Wolf.		Tu-ya-va, (canis ju				
Fox.	Ndu-á-ne-que.	[vatis).				
Deer.	Ni-hgup.	Dou-jez, (Ye-ba—	Ba-trû-nu.	Ñe.		Bá-que.
Guinea Pig.		Bá-tus. [gamma).	Huambu-schá-pi.			
Tortoise.		Só-no.	Drá-ti.	Te tác-ye.		Da-ti.
Fly.	Ni-Khuj.	Do-mo.	Be-bi.	Mue, (niglese).		Ve-re-ve-re
Mosquito.		Ca u.	Dri.	Mue.		Sani or Di.
Snake.	Ni-ra-ye.	Mi-imi-di.	Bâ-cua.	Naz, (all kinds).		Ba-cua.
Rattlesnake.	Ni-chi-ti.	O-lo-ba-huas.	Sum-ba-cua.			Ba-cua-da-da.
Bird.	Ni-me-lû.	Jo-me, (hen). (5)	Bû-ni.	Aij-tch.		Dia.
Egg.	Da-va-ri-mí-chi.	Jor-qua.	É-ja.	Jsen or Pen.		É-ja.
Feathers.	Nimcol-li.	Mu-mûn-qua.	E-nû-qua.	Phañ.		E-i-na.
Wing.	Ni mparjep.	To hai-á-hua.	En-nam-bai.	Pa-va.		E-na-bay.
Duck.	Ni-vurij.	Co-corre. [key).	Zû-zi. (z-th).	Oppa.		Sé-e.
Turkey.	Ni-rovi.	Ma-má-cu, (wild tur-				
Pigeon.	Npa-cu.	To-lo-do.				
Fish.	Ni-ka-ku.	Vi-lou.	Sí si.	Señ.		
Name.	E-hu-a-cu.		Em-bá-ni.	Ti, (very nasal).		E-ba-ni.
White.	Hmbára.	Tá-vu.	Pazáme. (z-th.	Aí-bal. [shame.)		Pa-sa-na.
Black.	Nim-ca-a rá.	Tû-ni.	Se-bé-mi.	Zín-cui, (also means		De-ve-na.
Red.	Nim bitsi.	Ra-bal.	U-tru-mé.	Choi-ñoi.		De-re-na.
Light blue.	Ma sá-sa.	Sru-bo.	Sa-va-mé.	Met-se.		Da-na-ne.
Yellow.	Maesuzuj.	Sérre.	Za hua-mí. (z-th).	Ñes-ñey.		Tid-ni a.
Light green.	Nik-cha-cha.	Noj-na.	Sche pí-ei.	Za——, (Jpe(.		Chi-na.
Great—large.	Ni-hi-ma-rá.	Me-réj-e.	Hay mi.	Der-tchi.		Aí-da.
Small—little.	Ti-ti-di-i.	To-chi.	Ba-ta-ví-chi.	Ztchanguis.		Chí-cli.
Strong.	Hmbe-re.	Li tes.	Tre-tre-mi.	Fer.		Tu-ché-da.
Old.	Yits-nám.	Bf jou.	É-si.	Pirt.	Noí-ra.	É-cli.
Young.	Hie-oc-he-re-hé.	O-ve-ní-huan-qua.	Dre-ja-ve-ve.	Phañet; Chotcho.		E-de-á-ve.
Good.	E-er-ets.	Dó-co-i.	Jun-dra.	Hen.(h pronounced)	Shûma.	Sai-da.
Bad.	Itjmûp-se.	Ruj-ra or Don-tóe.	É-ma-sá.	Achit; Achis.	Shûma-é-ma	Ma-dá-da.
Dead.	Hmu-cu-u-la-na.	Caí-ne.	Ma-nují-ji.	S.ñi.		Ma-nu-ji-ji.
Alive.	Yi-e-ré-re.	I-té-ne.	E-sche-vé-ve.	Za.		Ei-clé-ja.
Cold.	Meu-hul-lf.	Ji-ló-ca.	Vin-ná-ma.	Je-tis.		Bru-a-da.
Warm—hot.	Meu-hal-lic.	Vé-ó-ni.	Zin tri-trí-me. (z-th).	A-pâe.	I-quí-ni.	Sin-á-da. [tive).
T	O-fo-ho-já-li.	In-cla.	É-me.	Ye. (very nasal.	U-á-u, (Jene-u-a-ni).	E-ma, (É-á-ma ac-
Thou.	I-na-há-li.	Ul-cua.	Mi-ve.	Mi.	[Water. Hot.	Mi-cla.
He.	Yic-ho.	Us-co.	Tuve.	Mo. [Spanish).		Tu-e-da.
We.	O-hej-jal-ji-ná.	I-tli.	É-ca-má.	Tsiiñ, (ii French—ñ	Jó-a.	Ecuana, (Etsea dual).
Ye.	Nha ic-ho na.	I-bi.	Mi-cá-ve.	Mim.		Mi-cu-a-na.
They.	Ponayi-nigá.	Is-co.	Tu-ná-ve.	Mom.		Y-chu-cu-a-na
This.	Niull eje.	E-aí-ra.	I-yé.	Uts. (u French).		Yhe.

ENGLISH.	LIVING BESIDE THE RIVER MAMORÉ.			LIVING BESIDE THE RIVER BENI.			
	CANICHÁNA.	CAYUÁBA.	MOBÍMA.	MARÓPA.	MOSETÉNA.	PACAVÁRA.	TACÁNA.
That.	Yo-vi-e-je.		Cul-dréj.	I-chú.	Mo.		Ych-u.
All.	Ma-ta.		Ba-ra.	Hua-ná.	Ere; Erem.		Pa-ma-pa.
Many—much.	Chu-yu-gó.		Cau-ra.	Drú-je.	Day.		Yu-cu-á-da.
Who.	Ktan-hati.		Éj-clej-lan.	Hay-se.	Chinca; Tchis.		Ay dé ni.
Far.	Pá-yi.		Quí-la.	Huazumi. (z-th).	Moch.	Hua-sir.	U-que-da.
Near.	Co-ió.		Crú-e.	Dre-má.	Yme.		Narise.
Here.	Heum-ché.		É-ne.	I-e-zú. (z-th).	Oya.		U-pí-ca.
There.	No-coh-ché		Nos-dé.	I chú-zu. (z-th).	Move; Mive.		Chu-pia; Da-pi-a-vi.
To-day.	Mi-mo e-ru-if.		No có-a.	Je-á-ve.	Quiu.		Je-á-ve.
Yesterday.	Neo-he-ti-ji.		La-jé-mes.	Ban-tra.	Muñas.		Mai-ta püi-cha.
To-morrow.	Hama-eshi-ti.		I-máy-o.	Mai-ta.	Nog-no.		Mai-ta-püi-cha.
Yes.	É-he.		Dí-ra.	E-e.	Ehe. (h pronounced).		É-he.
No.	Ni-huas-h.		Cai-i.	Má-ve.	Am.		Má-ve.
One.	Me-re-ca.		So-ta-ru.	Pem bi-ve.	Zrit.	Nata. (doubling the	Pea; Peada.
Two.	Ca-a-di-ta.		Oi-ra.	Be-ta.	Pana.	Nata. thumb and	Be ta.
Three.	Ca-ar-ja-ta.		Taj-ra.	Ca-mí-scha.	Chibbin.	Nata fingersof both	Qui mi-scha.
Four.			Oi-ca-ra.	Pu-schi.	Ts-is.	Nata. hands then	Pu-chi.
Five.				Pi-schi-ca.	Canam.	Nata. repeat Nata	Pu-chi-ca.
Six.				Schu-cu-ta.	Ebe-uñ.	Nata. each timeand	So-ca-ta.
Seven.				(4).	Ye-ve-tí-ye.	Nata. Echasu at the	
Eight.					Quon-can.	Nata. last, making	
Nine.					Araj-tac. (j French).	Nata. ten).	
Ten.				Tunca. [ja.	Tac.	Echasu.	
Eleven.				Pembi-ve-tunca-bi-		Nata. (pointing to	
Twelve.				Beta-tunca-bi-ja.		Nata. each toe	
Twenty.				Beta-tunca.		makes ten more	
Thirty.				Camischa-tunca.		using Echasu	
Forty.				Puschi-tunca.		last meaning 20).	
Fifty.				Pi-schi-ca-tunca.			
Sixty.				Schu-cuta-tunca.	(Combination of		
Seventy.					Tac with the un-		
Eighty.					ities.		
Ninety.							
One Hundred.				Tunca-tunca.			
One Thousand.				Tunca-tunca-tunca.			
To Eat.	A-ha-li-ma.		Cai-ca.	Chan-cha.	Sexi.	Jai-jai. (3)	Dia-dia.
To Drink.	Au-ha-co-qui.		Ya-ló-e.	Jai-schi-ti.	Thi-ef.	Se-a-ni.	Ei-cli.
To Run.	Cam-co-ya.		Já-i.	Van-drun-dru.	Pi-qui-i.		Ju-dú-du.
To Dance.	Au-da-hda-ra.		Té-lo.	Ti-ri-ti-ri.	Ro-a-yá-qui.	Mu-nu-a-na.	Tiri-tiri.
To Sing.	Au-jar-son-is-na.		Leu leu.	Zá-tru. (z-th).	Yma-qui.		Sa-tsu.
To Sleep.	Au-jar-ja-na.		Joró-quo.	Ta-bi.	Cu-chi. (ch French).	O-sa-ni.	Ta-bi.
To Speak.	Au-jarp-hur-ma.		I hua-ni.	Mi-mi.	Misí. (Misimi speak		Mi-mi.
To See.	Au jar-co-iv-óe.		Vai-es-qui.	Jam-ba-ti.	Nai; Cavei. [you).		Ba.
To Love.	Au-ari-hua-na.		Ye na.	Imbu-nim-bu.	Raise.		Es-bu-né-ba.
To Kill.	Au-artch-ji-na.		Te-coi-na.	Ma-né-me.	E-ja-ti. (j French).		E-ma-nu-a-ni.
To Sit.	Au-jar-sue-na.		As-qui.	A-nim-bo-ti-a.	Bey.		A-ni-ú-ti.

To Stand.	Ti-a-ta-u-si.	En-qui.	Nĕ-ti.	Quich-bei.		Enu-tsi-ne-je-ne-tsi.
To Go.	Au-jar-ti-qui-na.	Jai-i.	Pū-ti.	Yn-cai.		Pu-ti.
To Come.	Au-jar-tui-nas.	Yé-la.	A-pué-ya.	Aisi.	Que.	Pue.
To Walk.	Au-jar-cui-la-na.	I-ló-ni.	A ze. (z-th).	Mii.	Ca-qui-a.	A-re-a-sé.
To Work.	Au-jar-si-li-la-na.	Tis-cārib.	Mun-dru.	Cari-ta-qui.		Mu-du-mu-du.
To Steal.	Dak-siu-si-na.	Tol-ca-rā-na.	Tri.	Choay. (ch French).		Tsi.
To Lie.	Yik-tod-se.	Ti ja-sí-pa.	É-á-na.	Ue-ñey.		Bi-du-mi-mi.
To Give.	Au-dar-chi-ti.	Cui-lé-ti.	Ti-á-na.	Som-ei.		Tia.
To Laugh.	Au-jar-do-cu-na.	Jo-sí-chel.	Ja-schi-ba-ti.	Yé-se.		Y-de-bá-ti.
To Cry.	Ita-ji-nu-e-na.	Ca-má-me.	Je-ja-je.	Vuorac.	Jo-ya-na.	Tsia-tsia.

In all these idioms the Spanish rules of pronunciation are followed:

A-áh; E-a; I (or Y alone -ēē—o-ō; U-uin, you; J-h, (h is silent or scarcely perceptible); Que-ka; Qui-kēē; Gue-ga; Guí-gēē; Ll when not divided as ll in William; Ñ the sound of "on" in onion.

MOBIMA —1. One word for stomach and heart. 2. No general name for lake or river. 3. Paichlen, is an elevated land which is surrounded by water during the rainy season; Chammo means forest—together they indicate the places selected for residences on the cattle estates, which, during part of the year, are truly wooded islands. 4. Dimas, grass for thatching. 5. All birds have special names.

MAROPA.—1. Eldest brother says Ca-ni to his youngest sister. 2. No word for toes; Fingers and thumb are "the head of the hand." 3. Warrior means a fighter, or quarrelsome person. 4. 7-8-9, 17-18-19 are expressed in Spanish. The seasons are the dry—Mu-rí-mi; and the wet—Nai má-ra.

MOSETENA.—1. Day means "it is daylight." 2. Bears are found in the mountains where the Mosetenas reside, but not in the low lands where are located the other tribes; with them bear means the great ant-eater, which is called in Spanish, "flag-bear." Ch,Ph. Z and J have the corresponding French sound.

PACAVARA.—1. Chu-chu ih the Maópa idiom means to nurse. 2. Jene-u-a-ni is hot water. 3. Jai-jai-o-ra-qua-ti. roast meat.

GEOLOGY.

TERTIARY COAL MEASURES OF GUNNISON COUNTY, COL.

JOHN K. HALLOWELL.

Some time since, a communication in the form of a query was published in the Denver and Gunnison papers over the signature of Charles Henry Baker, M. E., asking, in reference to the coal found in that county, "Is it anthracite?"

I send you the following, thinking it may help to settle the question, as well as give some additional information of possible practical value; this being the result of personal observation during a close examination lasting nearly five months, spent in and around these coal measures, with a view to determine their age, structure, and, in a measure, their commercial value, as seen locally and in comparison with data obtained from other sections.

The first five years of my geological work being among the coal measures of Missouri and Kansas, I have always been much interested in what had been brought to me in the way of specimens from the Gunnison country coals. For two years these specimens had come, the parties having the same claiming the product to be anthracite. This I disputed, as no one could inform me of any change in the connecting rocks that showed an opportunity for a change in the coal, by metamorphism, from a bituminous coal to an anthracite. In fact, I considered (without tests) that the appearance of the specimens was, in gravity, fracture, and luster, against such a result. The coals appeared more like the Albertites of Nova Scotia, or a coal highly charged with bitumen. On the other hand, the chemists' analyses shown me gave such high results in fixed carbon that it must be rated as an anthracite; and if the latter, the rocks accompanying the coal-seam must show a corresponding change. As stated, of this none could tell me, and, as a geologist, I must confirm what the chemist had shown or find out the reason why.

The geological structure of this coal measure formation, as seen by myself in the Crested Buttes and Ohio Creek basins, was a revelation, as nothing like it is known or described in any works that I have; many things appeared to be reversed and not at all analogous to other known localities where coals occur. So great was this difference that I must give the facts as seen by an ordinary observer, and then try correctly to describe the geological structure, adding thereto a

description of the characteristics of other sections, that the difference may be realized.

Take the first openings back of Crested Buttes town, and to my amazement the coal lay upon shale, with a solid sandstone roof; and for 1500 feet thick, as these measures appear to be, the rock formation is shale, coal, and sandstone; no limestone belongs to this series, and nowhere does any animal life appear to have existed in the waters that deposited the sediments making the present existing sandstones and shales. All other coal measures known have most abundant remains of shell-fish in the limestones, sandstones, and shales of their respective ages.

The only fossils are the impressions of leaves of land plants and trees that floated out to sea, sank, and left a record in the sands, saying here was a tropical climate, as most beautiful palm-leaf impressions are obtained in one horizon, as well as many other leaves grown in a like latitude or climate, whose names I do not know.

The sandstone itself is a marvel, in places many feet thick, and repeated just the same many times in different strata; as, in looking for a cause that would account for the absence of life in these waters, I found the sandstone was not the *detritus* from the wearing away of other rocks, but was a precipitation of particles of quartz from a hot sea, carrying an excess of silica in solution, cemented by a small amount of material that was produced from dissolved feldspar; not a rounded pebble in the whole series, but even-grained and homogeneous throughout.

I examined 100 square miles of these measures, and in the midst of it all found 2000 acres of anthracite coal, the finest of its kind known on the continent, a four foot vein, giving from 90 to 94½ per cent of fixed carbon and no iron or sulphur in an appreciable quantity.

To finish with, 1000 feet of conglomerate had at one time been deposited over the whole of this, and in another locality recent lavas were found overlying these Tertiary sandstones.

If the above, which can be seen by any one, was not a geological problem, I have never met one. To solve it, I had to find the rocks of the next oldest age, which proved to be Cretaceous, large shale beds of this age existing partly metamorphosed to a slate, and containing the characteristic fossil—*Inoceramus*—of the Cretaceous seas.

The closing of this age gave me the key to very much, as locally it is marked by one of the most stupendous eruptions of volcanic paste that ever was known, covering hundreds of square miles on a Cretaceous sea-bottom, not only flowing over these muds, where lived the *Inoceramus*, but also elevated in enormous masses, which now show as mountain ranges, as well as single mountains or cones. This volcanic mass is now geologically identified as granite porphyry, its constituents being silica, horn-blende, feldspar, a small amount of mica, and occasionally a small crystal of sanidine. The feldspar separated into beautiful crystals, with perfect sides and terminations, some of them of large size, held most firmly by the silica which makes the bulk of the paste. So much harder is this inclos-

ing paste that it was difficult to get good specimens of the crystals, the latter decomposing more readily, and leaving perfect casts in the rock.

This granite porphyry would make the most beautiful building stone, as it is more easily quarried than Maine granite, more readily dressed, is just as durable, will take as high a polish, and when finished is as beautiful as any marble known, has no mineral constituents to oxidize and stain, and is in inexhaustible quantities. It comprises such mountains as Crested Buttes, Gothic, Carbon, Edgely, Beckwith, and Marcellina, as well as the ranges known as Ragged Mountains, the Anthracite range, and Wheatstone group. Near to part of these now run two railroads, and in time along these lines will be mammoth quarries; for here is a better rock to send East than the East can possibly send West.

The next move of nature in this locality was to elevate these submarine mountains above sea-level, so that shallow marshy seas were at their bases. The climate was at this sea-level, I think, more tropical than anything that we are acquainted with at the present time; as not only was the latitude such as to have hot seasons, but, in addition, towering up thousands of feet in every direction, were these mountains of volcanic material, giving off large volumes of heat by radiation; large masses of volcanic rock cool slowly in the atmosphere. In the gorges and open shallow seas of this Tertiary age, at the feet of these mountains, and among all of this warmth—and very great moisture there must have been in the atmosphere, too—commenced the growth of the plants that now make these Tertiary coals. How long time is, under such circumstances, as we reckon it, we can have no data; but sufficient was the period of rest here, for these plant-growths to accumulate several feet thick.

Here I want to do a little local reasoning, that in principle may apply to other eruptive localities. To begin with, this eruptive matter must have been the product of internal heat below the earth's surface; the overlying crust must have been proportionably strong to hold such a vast quantity confined, with its cumulative force of steam and gas; when this power had accumulated sufficiently to exert itself, the eruptive power was in ratio to the power used, which again was in proportion to the thickness or resistance of the overlying earth-crust; after the eruption, there would be an internal cavity approximating in size to the cubic contents of the mass recently brought to the surface; the original surface rocks would have the tonnage to support represented by the mass of eruptive material; this weight on the underlying shell then became to a greater or less extent plastic, and, without internal support, would cause a local sinking at varying periods, which periods of subsidence were represented by changes in the more recent sediments which were afterward deposited on the new floor or sea-bottom; and each and every one of such changes of sea depths can be counted by the variations in the newer strata of rocks.

Noting the above reasoning, in these coal basins, we find after a time a subsidence, and on top of the coal plants flowed a greater depth of water. The mountains were still hot, the exposed surfaces somewhat decomposed, this influx of water was heated to a great degree and took into solution silica, which com-

ing in contact with the organic matter in the then sea-bottom, was precipitated, and also by the gradual cooling of the waters.

Here this section for a time was stationary, and the sands gradually filled these watery depths until another shallow sea was repeated, and a subsidence followed which washed all of the loose moveable soil of the adjoining lands and islands into the deep sea. This material made the mud deposit—shales now—which follows the sandstone. On these muds in shallow water the growth of the coal plants again commenced, to be followed in repetition by what has already been shown; and this was repeated six different times, for eighteen different subsidences and periods of rest are now shown to have occurred here locally; perhaps more, if we could get at the deepest part of any one of these basins. The strata built up, as near as I could ascertain, aggregate 1500 feet in thickness.

Then followed a greater subsidence at once than at any single time previous; a wider area of territory was acted upon by deeper waters; and instead of sandstones, resulting from precipitation, we have 1000 feet of conglomerate, which covered all of the named mountains of granite porphyry.

This Tertiary age was closed by the eruption of the lava showing on the dividing ridge between Ohio Creek and East River near Howville or Jack's Cabin. Subsequent erosion shows this lava on top of the Tertiary sandstones, and subsequent erosion has worn down these sedimentary rocks deposited in the old mountain gorges between peaks and ranges of granite porphyry, laying clear the structure from the latest strata to where it began, and all to be seen and reasoned out as I have shown.

Now for the anthracite. I spent two days on Anthracite range, camping out to get at the following: Standing on the top of this range, it could be seen that, at the time of the recent or lava eruption, a deep gorge or crevice had opened from the eruptive point through between Wheatstone group and Mount Carbon. This opening came against the end of the Anthracite range, with the effect of setting or splitting off a single mountain mass by itself. This crevice, evidently, was also filled with eruptive matter, not coming to the surface, but exerting force and pressure sufficiently to slowly crowd this single mountain northward, which in its turn pressed against the coal measure strata built up at its feet and against its sides with such force that these originally horizontal sedimentary rocks were raised to an angle of twenty-one degrees. The heat and pressure generated by this rock movement metamorphosed a coal-bed under 2000 acres from a bituminous coal to a four-foot vein of the finest anthracite that is now known. Here geology and chemistry agree, and at this point, I think, Mr. Charles Henry Baker, M. E., is answered that it is anthracite.

The eruption of this lava raised the Tertiary beds so that all of the strata dip away from the lava outcrop, eight and one half feet in each 100 feet; although in the Ohio Creek basin, I think, from what I saw, that the dip gradually increases as the lava mesa is approached. The sedimentary rocks broke in short cross-sections; along these breaks, lines of erosion now exist, wearing the surface into

numerous gullies, exposing the coal-seams and thus making opportunities for original discoveries.

In the Ohio Creek basin, the greatest development is in the South Park coal-seam, opened under the superintendence of Mr. William Housely. The work is laid out on the English or long-wall system, and certainly showed the best work and most economical results of any of the work which I examined. In this basin, another vein, the Richardson, has been opened on the Augusta and Owens claims, as well as on many others.

A section of these coal measures in the Crested Butte basin, where they are principally worked, would approximate as follows:

No. 1.	300 feet from top of hill is	1 foot of coal.
No. 2.	80 feet below this is	3 feet of coal.
No. 3.	65 feet below this is	4 feet of coal.
No. 4.	185 feet below this is	6 feet of coal.
No. 5.	70 feet below this is	10 feet of coal.
No. 6.	To this add in the Ohio Creek basin 200 feet below is	7 feet of coal.

Seam No. 1 is practically worthless.

Seam No. 2 is that opened and known as the Howard F. Smith bank, up Slate River.

Seam No. 3 is opened on the Smith & Jefferson claim, on the Weaver property, and one place between the anthracite coal near Irwin, on Anthracite range, is in this horizon.

Seam No. 4 is opened by the Colorado Coal and Iron Company, and in Baxter's Gulch. In the Ohio Creek basin, No. 4 is represented by the Richardson, Augusta, Kubeler, and Owens openings.

No. 5 is the coking coal vein now worked in the Crested Buttes basin, by the Colorado Coal and Iron Company.

No. 6 is only known in the Ohio Creek basin and in the South Park Company's openings.

The eruption of the lava caused the fissuring of these Tertiary rocks, so that now we have what has hitherto been unknown, namely, silver veins containing rich ruby and native silver ores, passing through coal measures. Where these veins break though, the coal-seams are liable to be broken and faulted; and in immediate vicinity to the fissure-vein, the coal will contain more or less iron and sulphur; at the same time, fragments of the coal will be found inclosed in the gangue-rock of the crevice.

Having some remarkable analysis of fixed carbon shown me from an opening up Slate River, three miles beyond Crested Buttes, I went especially to examine the openings on the property. This vein would be the No. 2 of the series. The coal originally outcropped in a small gulch eroded into the side of the ridge rising from Slate River, and opposite to the entrance to O-Be-Joyful basin.

The coal was followed in for nearly 200 feet, most of it being good merchant-

able coal, some of it having fixed carbon enough to be rated as an anthracite, and showing remarkably well in the face for this No. 2 vein. Numerous cracks or faults occur in the roof or sandstone, now making mud seams; near these, the coal was broken and worthless.

A new opening has been made into the hill from the head of the gulch, now nearly 300 feet in. On one side of this opening the coal is constant; on the other, a fissure-vein filled with eighteen inches of calc spar, coming from the direction of O-Be-Joyful Gulch. This will certainly carry mineral with depth, and makes a connecting link through to the veins of Washington Gulch, and absolutely proves in fact what I had first advanced as a theory, that in localities the mineral veins would be found passing through coal seams.

I followed these Tertiary rocks across the head of Washington Gulch, between Gothic and Baldy Mountains, back of Belleview Mountain, down the valley of Rock Creek, over Mineral Point, Meadow and Arkansas Mountains; and could see where they again came in below the lake near Rock Creek. Here erosion shows these old Tertiary sea-bottoms to have been deep enough for the coal-seams to again appear, and report says there are much stronger veins than those in the particularly described basins.

The coal series of the Front Range of Colorado, as well as in Middle and South Parks, belong to the Cretaceous age. While I found Cretaceous rocks in abundance on the west slope in the section examined this season, I did not find the coal of the same age, except in one locality, namely, Chicago Park, two miles from Pitkin. Here some holes have been sunk, disclosing the coal, but also showing, from evident and easily perceived causes, that it is worthless, being highly charged with iron and sulphur. The quantity here also must be very limited.

As to the character of plants that grew in these waters to make these coal-seams, there appears to be such a diversity of opinion among the highest authorities, that I do not think this character of metamorphism has been sufficiently proved as yet. This I would like to record, that from my personal work this season, the great difference between ordinary bituminous coal and that which is called the coking coal, would certainly seem to arise from a material difference in the original vegetation.

I spent five days at Jack's Cabin, examining the rocks in connection with the lava outcrop, principally, because I had been informed that large bodies of hematite iron existed here; in fact, one of the United States geological reports gives this locality as the place where the largest body in iron ever seen occurs. After five days' work, I could not find it, and came to the conclusion that the first examination was a hasty one and the conclusion jumped to that this black lava was hematite iron, when, as a matter of fact, it does not contain ten per cent of iron.

I thoroughly examined the eroded basin between the two lava mesas, hoping to find evidence of the coal-seams here, and that the heat and pressure from the over-lying eruptive rock would have changed such coal to an anthracite, but I

could not find a particle. At present, I feel, from the showing, that the basin is not eroded to great enough depth to catch the coal-seams. On the other hand, there is a possibility, for all that now shows, that on this edge of the coal basin the underlying rocks rose, and only allowed the upper coal measure strata of sandstones and shales to be deposited over the older rocks, and the coal-seams do not exist.

I note the above from the fact that farther up on the Slate River, this same thing has occurred, from about the entrance to O Be-Joyful basin. The Cretaceous shales appear by the roadside, and above them is the overflow of granite porphyry, overlain in turn by the strata of Tertiary rocks, but only having in places the upper veins of coal Nos. 1 and 2, while the two seams worked by the Colorado Coal and Iron Company are entirely wanting. This occurrence is repeated up Coal Creek, a short distance from the Colorado Coal and Iron Company's openings; a break occurs across the hill between Coal Creek and Baxter's Gulch, which, I believe, will mark the end of the two lower veins of this basin westward.

Such results as are set forth in the above paragraphs show how limited is the real coal area of the Crested Buttes basin, while on the Ohio Creek side, such things do not appear to have occurred, which makes the area of this latter basin very much greater for a possible product of merchantable coal.

In speaking of the geology of coal sections, Dr. J. S. Newberry says "that many of the coal-seams of Ohio have been worked into, and exposed the following phenomena to view:

1. "A fire-clay below each seam, permeated with roots and rootlets of stigmaria.

2. "A coal-seam having a maximum thickness of six feet in the bottom of the basin, thinning out to feather edges.

3. "The coal on the margin of the basins is sometimes thirty or forty feet above its place in the bottom.

4. "An average of two and a half per cent of ash.

5. "A roof composed of argillaceous shale, of which the lower layers are crowded with impressions of plants."

The above might be used for a general description of all bituminous coal-fields of the Carboniferous age.

The field I examined differs from No. 1, in that there is no appreciable amount of fire-clay, and argillaceous shales make the floor; from No. 2, in that in one place I found the seam of coal full size, abutting directly against granite porphyry, although, when the field is fully explored, there may be localities thinning out to feather edges, the same as in Ohio.

No. 3 might be found to differ locally in all coal basins. Of No. 4 the same might be said.

I think these Tertiary coals average more than two and a half per cent of ash.

They differ from No. 5 in that the roof is sandstone and the shale occurs below the coal.

A recent examination of the Cretaceous coal at Golden, Colorado, shows veins varying from six to sixteen feet thick, average nine feet, standing nearly vertical, a slight dip to the west, with a *roof of fire-clay*, affording excellent material for the manufacture of fire-brick and terra cotta.

Concerning the economic values of these Tertiary coals, I obtained the following data. Tests were from the Smith bank:

Moisture at 105°	1.16
Volatile matter at red heat	4.70
Fixed carbon	90.20
Ash	3.94

Specific gravity at 60° Fahrenheit 1.410, a cubic foot of coal weighing eighty-eight pounds. Of five samples:

Moisture and volatile matter was	7.346
Fixed carbon	85.062
Ash	7.592

Other tests gave the lowest fixed carbon at seventy-seven per cent. Average amount of sulphur is 0.403 from three separate veins.

In calorific power the maximum amount of carbon is 80.80.

Pennsylvania anthracite gives	77.88
Colorado anthracite gives	74.08
Cañon City, Colorado, Cretaceous coal	60.61
Wyoming Cretaceous coal	63.74
Weber Cañon, Utah, coals	57.57
California coals	55.26

The above is a statement made by Charles P. Williams, chemist, Philadelphia, Pa.

Had the anthracite from the Anthracite range section been used for a comparison of calorific power, I am confident the record would have equaled the best Pennsylvania anthracite, as this coal is constant in fixed carbon from ninety to ninety-four and one half per cent.

From another source I learn that the amount of illuminating gas from these Tertiary coals is seven and a quarter cubic feet per pound of coal, or 14,500 cubic feet per ton of 2000 pounds, not equaled anywhere as far as now known, except perhaps by the Albertites of Nova Scotia.

Of the coking coal seam, the following was obtained from Mr. James K. Robinson, Superintendent of the Colorado Coal and Iron Company's mine. Sample came from 1200 feet in, and was the latest test up to October 6, 1882:

Water	.72
Volatile matter	23.24

Fixed carbon	71.91
Ash	3.93

In comparison Connellsville coal shows:

Moisture	1.260
Volatile matter	30.107
Fixed carbon	59.616
Ash	8.233
Sulphur	0.784

While tests from a coking coal in Kentucky ranged in

Volatile matter	30.060 to 37.160
Fixed carbon	54.740 to 62.100
Moisture	2.000 to 8.000
Ash	2.900 to 4.340
Sulphur	.494 to 1.475

Thus showing these Tertiary coals far ahead in economic value.

The average value of bituminous coal at Golden, Colo., for two years has been $3.30 per ton; cost of mining and hauling, $2.57 per ton. In the East, this grade of coal is worth, on an average, $1.22 per ton; cost of mining, $0.88.

Connellsville coke at the ovens is worth $1.75 per ton, and a protective freight tariff in favor of Colorado production of $20 to $45 per ton.

With the above named freights, Gunnison County ought to get a share of that business on a very profitable basis.

DENVER, COLO., January 8, 1883.

ORIGIN AND CHARACTERISTICS OF PRECIOUS STONES.

Before the Chemical Society of the School of Mines in Columbia College, Professor Thomas Egleston, Ph.D., delivered a lecture on precious stones, in which he described their origin, characteristics and imitations. The history of gems, the lecturer declared, was the history of nearly all the intrigues, wars and good deeds of mankind since the world began. Many superstitions have been attached to precious stones. The amethyst was considered a cure for drunkenness and was dedicated to Bacchus; jasper was used as a charm by athletes. Although the diamond is made of common carbon, no successful attempt has been made to reproduce it. Its composition was discovered in 1694, and its weight was determined by the weight of a bean found in the east called a carat.

A diamond of more than ten carats is called princely; a diamond of more than 100 carats sovereign. There are not 1,000 known diamonds that weigh over ten carats, and not twenty that weigh more than 100. The value of the diamond is determined partly by color and partly by weight, and in this country there is an absurd custom of considering no diamond worth having that is not

absolutely white. Flaws in diamonds are black specks, carbon that has not crystallized, or bubbles of gas or liquid, or natural faces of the diamond that have not been ground off. Black diamonds are mostly used for tools, but in Russia they are worn when the Court is in mourning. They are beautiful gems with a brilliant lustre.

The lecturer described some of the famous diamonds of the world, and then characterized the ruby as the most precious of all the stones when it has the true pigeon-blood color. A ruby of five carats is worth twice as much as a diamond of the same weight. The ancients held this stone to be a charm against poison, disease, and wicked thoughts. Sapphires, to be beautiful, must be of uniform deep blue. The lecturer said he had seen a small stone which was ruby on one side and sapphire on the other. In an experience of twenty years he had seen only five oriental emeralds and one oriental amethyst. Of the five varieties of cat's-eye that he had come across, only one—chrysoberyl—was valuable. The deeper the green of the emerald the better, and this stone loses no brilliancy by artificial light. Its color was supposed to be the same element that colors the leaves of trees. The opal, considered the unlucky stone, was to the ancients the only gem that seemed to store up the light of day. It cannot be successfully imitated. The hard opal is found in Hungary, the soft in Mexico. Five per cent of water is a constituent of the latter, and when placed in water the dull stone resumes its wonted brilliancy. Garnets are found in Bohemia; the most beautiful are gathered in Nevada. They have been seen of almost every color of the rainbow, but green and red are used in jewelry.

The lecturer urged in conclusion that his auditors should not lose confidence in human nature by reason of the widespread imitation of precious stones which he had described.

ASTRONOMY.

A NEW STAR AND THE STAR OF BETHLEHEM.

WILLIAM DAWSON.

The *Scientific American* is authority for advancing the idea that a new star of great brilliancy may become visible in the constellation of Cassiopeia, some time during the present or coming year. In the night of November 11, 1572, as Tycho Brahe, a noted astronomer of Denmark, was returning from his observatory, he found a group of persons looking at a brilliant star in Cassiopeia, which he felt sure was not there an hour before. It then shone like a star of the first magnitude; but grew brighter for some time and equaled Venus in brilliancy, when it could be seen easily with the naked eye in day time. In a short time it

began to decrease in brightness—steadily growing dimmer for several months, until about the middle of March, 1574, when it disappeared entirely; having thus been visible, after a very sudden appearance, during a period of sixteen months. This star was white when first observed; it afterward changed to a red color, and finally again to white.

Old records indicate the observation of a similar star in nearly or quite the same place in 1264, and 945. These dates indicate periods of 308 years and 319 years between the times of visibility of these grand stellar shows. Applying three more such periods backward curiously enough brings us to about the time of the birth of Christ; when a bright star appeared as a guide to wise men in the East. Now there are one or two other circumstances by which it might seem possible to reconcile the "guiding star" with the one above described. The Nativity was probably in the latter part of December, at which time Cassiopeia, and of course any star in it, is on or near the meridian quite early in the evening; and not very far from the zenith, though considerably north of it But as the night goes on these stars appear to move westward on account of the earth's rotation; and further west also by reason of the earth's revolution around the Sun. The place where the wise men lived and started from is perhaps 200 or 300 miles easterly from Bethlehem, and it would seem that their star "the guiding star" should be westerly from them and move eastward, apparently, as they approached the place where the young child was; for when they arrived the star was over that place. But may we not safely admit that the star which led the Magi to the infant Jesus was a supernatural phenomenon in no way connected with the fixed stars in the distant heavens? Some persons have believed that the new stars of 1572, etc , were simply apparitions of the "Guiding Star" seen at Bethlehem, so they, or it, has sometimes been called the "Star of Bethlehem."

Other new or temporary stars have been seen at different times—notably in 1604, when a bright star blazed out rather suddenly in the constellation Ophiuchus; and one of less prominence was observed in Cygnus, May, 1866.

Now, there are quite a number of stars which are always visible and yet are known to change in brightness. They are called "variable stars." Prominent among them is Algol, a star in Perseus, which commonly shines as one of the second magnitude. But every three days (or rather two days and twenty hours), the light of this star diminishes to that of the fourth magnitude, where it stays for twenty minutes, and in three and one half hours resumes its wonted brightness. A variable star in the Whale, called Mira, is invisible to the naked eye most of the time. But about every eleven months it shines out with a brightness of second or third magnitude; remaining so for about two weeks. It loses light for three months and disappears to natural vision. In about five months afterward it becomes light enough to be just visible to the naked eye—a sixth magnitude star—and reaches its maximum brightness in three months more. But the changes of Mira are less regular than those of Algol. Its period is sometimes longer, and other times shorter, than eleven months. Its greatest brightness is sometimes that of second magnitude, and sometimes of only third magnitude.

This "wonderful" star is expected to be bright again in May, this year; in April, 1884; March, 1885; February, 1886, and so on—about a month earlier each year. And now, may we not reasonably infer that the new stars of 1572, 1604, etc., are but variable stars of long periods, and will brighten up into visibility at their appointed times? A telescopic star has long existed nearly or quite where Mr. Brahe saw his brilliant star in 1572; but whether it is the identical star is rather uncertain.

Cassiopeia is on the opposite side of the North Star from the Great Dipper, and nearly as far. It may be known by three stars in the form of a triangle, and one above (as seen in the evening at this time of year). The place where Tycho's star appeared is just to the right of the triangle, nearly in the point that would fill out the square. There is, indeed, one or two small stars in that corner, or region, which may be seen when the sky is clear and there is not too much moonlight. Make yourself familiar with these stars; and the new star, or its apparition, may be easily recognized when it does appear.

SPICELAND, IND., March 8, 1883.

ANNOUNCEMENTS OF ASTRONOMICAL DISCOVERIES.

For several years the Smithsonian Institution has done valuable service in collecting and distributing information of discoveries and phenomena that require immediate and wide-spread investigation. This labor was undertaken and continued because there seemed to be no other way by which the want could be filled. But the need of a more speedy and accurate system has been strongly felt, and has resulted in the transference of the work to Harvard College Observatory. Mr. John Ritchie, Jr , of Boston, has been appointed to take charge of this service, and it is he that has mapped out the details of the scheme. The plans include European as well as American observatories. An association of about fifty European observatories has recently been formed for the same purpose, and this association has requested Harvard College Observatory to cooperate with it and forward information of American discoveries. As there is also cable connection between Europe and South Africa, South America, and Australia, the system is quite complete, and may be looked to as a means of facilitating the work of the astronomer.

The outline of the plan, as taken from the circular, is as follows: Discoverers of asteroids, comets, suspected comets, or of any celestial phenomenon demanding immediate attention are requested to telegraph at once to "Harvard College Observatory, Cambridge, Mass." Such announcements will be at once cabled to Dr. Krueger, Kiel, Germany, and by him distributed to the European Union. They will also be distributed in this country in three ways—1. Through the Associated News Companies; 2. By special circulars of the *Science Observer;* 3. By special telegrams.

The first two of these methods are already in successful operation and need no

explanation. The special telegrams will contain that information which experience has shown to be especially valuable. Whenever possible, these telegrams will be in cipher according to the *Science Observer* Code, a cipher language devised to lessen the number of words and to render the message less liable to mutilation and misunderstanding. To those persons who do not possess the code, the telegrams will be sent in ordinary manner, but abbreviated according to the following form:

TELEGRAM.—Comet Swift eleventh May fifteen six ascension zero fifty-nine north fourteen thirty-six plus six south four tenth.

TRANSLATION.—Comet discovered by Swift, May 11d. 15h. 6m., Washington Mean Time, in R. A. oh. 59m., Declination + 14° 36′. Daily motion, R. A. + 6m., Declination—4′. Tenth magnitude.

The date will be expressed by the name of the month, preceded by an ordinal number giving the day of the month, and followed by two numbers expressing the hour and minute in Washington Mean Time (civil). Right ascension will be given in hours and minutes, preceded by the word "ascension." Declination will be given in degrees and minutes, preceded by the word "north" or "south." Daily motion in R. A. will be given in minutes of time, preceded by the word "plus" or "minus," and in declination in minutes of arc, preceded by the word "north" or "south".

Magnitude will be expressed by an ordinal number.

The actual expense of sending the telegrams will be borne by the persons receiving them, though, for convenience, the charges will be prepaid and annual accounts sent to the subscribers.

Mr. Ritchie has already had considerable experience in this kind of work while sending the Special Circulars of the *Science Observer;* and his success in this almost guarantees the success of the larger undertaking.

PHILOSOPHY.

INDUCTION IN SCIENCE.

PROF. H. S. S. SMITH.

The scientific method, as usually understood, is the method of induction. By it the statement of a law of action is formulated from a knowledge of many facts that bear on the subject. The progress of science clearly shows that the principles of induction may be used in two ways and we may call them, for convenience, qualitative induction and quantitative induction. In many respects they differ widely from one another. The qualitative is essentially metaphysical in its manner of procedure and as such, in many instances, produces naught bu

barren results. The quantitative is the true scientific method of dealing with facts, and it is by its aid that real advance is made.

Qualitative induction is that which, starting from a knowledge of a connection between two events, or of the fact that a certain phenomenon is consequent upon a certain combination of circumstances, produces from this knowledge a generalization of a higher order, but of less exactness. There is no estimate of the amount of action either in the facts on which the hypothesis is based or in the hypothesis itself. The kind of action is the only consideration. It is not uncommon to find that the natural results of the supposed action have been overlooked, for had they been considered it would have been seen that they be directly contrary to known facts. Sometimes considerations that are connected with the subject are entirely neglected and when brought to bear on the point, even in their qualitative aspect, are found to nullify the whole argument. Taken at its best, qualitative induction is unsatisfactory, and frequently proves misleading and baneful. The operation requires a well trained scientific imagination, and it is too often true that the scientific part is less developed than the imagination.

Quantitative induction is that method of procedure in which accurately known facts, known both in kind and in amount, are taken as the basis from which the advance is to be made. On these facts is built a generalization which conforms to the knowledge already possessed and awaits the development of new facts with a considerable degree of confidence. For it is one of the sure foundations of science that nature is ever consistent with herself; although her laws are contingent truths, they are ever constant. If, after the best endeavors, the generalization can only give an explanation of the kind of action, and is unable to determine the amount, it is a theory, and reaches its highest limit when it can predict a true result from a given combination of matter and force. Should it attain the perfection of being stated in a definite mathematical form, it becomes the expression of a law, and as such is accepted as truth. A generalization thus formed has in it the elements of exactness. It knows its grounds and stands on its own merits. Founded on facts it is as near the truth as the efforts of fallible man can place it. The offspring of labor, rather than the child of fancy, it has come to stay and to make its presence felt in thinking minds. It is the result of a slow growth. The accumulation of facts may have occupied years; some people collecting them with the definite object of reaching an explanation, others gathering information either by accident or for the mere satisfaction of learning "some new thing." It is never given to one person to gather all the facts and develop the result even in one line of research. Life is too short. Seldom indeed that one person formulates a theory in all its completeness. Usually, the final result is the outcome of the labors of many men. It is not so much the work of man as it is the answer which nature has given to patient questioning and persevering scrutiny.

In physics and astronomy—the sciences which deal with the very small and the very great—we find example of both kinds of induction. The minuteness and

rapid motions of the molecules, and these are the units of physical problems, render them inaccessible to our grosser senses and it becomes necessary to study them as best we can by the effects that they and their motions produce. By correlating and comparing the knowledge thus obtained, it is possible, at times, to learn somewhat of the nature and conditions of the molecules themselves. Sometimes the result, satisfactory at first, has been found to be fallacious; sometimes it contains the elements of truth and grows. Newton, in order to account for the phenomena of light, advanced the corpuscular theory—a qualitative attempt. Put to the test of fact, it failed. Then Hooke and Huyghens put forth another qualitative hypothesis—the undulatory theory. Newton supposed that light consisted of exceedingly small portions of matter sent out from a luminous body in all directions and with inconceivable, though finite, velocity. The undulatory theory supposes the existence of the luminiferous ether, a continuous, elastic and very "subtle" medium, pervading all space. When considered casually, these two suppositions seem equally improbable. But nature herself has decided between them. The corpuscular theory has been disproved, while the undulatory theory, though still awaiting its ultimate and complete establishment, is steadily gaining ground.

In astronomy, the vast distances—too great to be even imperfectly comprehended, and huge masses—too large to be the subjects of experiment, render progress slow and complete explanation difficult. Time is the chief element of success, time in which the unknown laws, by their continuous action, may produce results that can be interpreted. As a finished example of quantitative induction we may take the law of gravitation. Tycho Brahe and Kepler had laid the foundation of facts on which it was to be built. Newton, taking these facts and dealing with them in the most rigorous manner, produced the clear and mathematical statement of the law. It sprang full grown from his brain. It has not been changed, increased, or modified by subsequent researches. The work was finished when he proved that the moon was rigorously subject to the law.

But is seldom that a theory can be framed as completely as this when first presented. Qualitative induction has its field of usefulness, and without it actual progress would be slow. There are but few men that are sufficiently patient and have enough faith in the future to spend their days in the laborious accumulation of mere facts and figures. The work is apt to become pure drudgery unless there is the impetus of comparing the facts with some hypothesis. A working hypothesis is of itself an incentive to new work and new discoveries. It gives glimpses of unexplored territory and the natural desire is to enter and investigate. Lockyer's hypothesis that the so-called elements are compound and that the real elements only present themselves as such under the tremendous temperatures of the Sun has produced, beside the inevitable discussions, sound work and real advance in solar physics. Maxwell's statement of the theory of the connection between electro-magnetism and light has stimulated research and seems to promise, in one direction at least, an explanation of that marvel of the philosophers, action at a distance. Ampére's idea that magnets are but collections of currents of

electricity greatly simplified the understanding of magnetic phenomena and has resulted in combining the two subjects of galvanism and magnetism into one—electricity.

Although there are times when qualitative hypotheses are allowable and useful, it not unfrequently happens that they are confidently offered to public consideration without any sufficient cause for their existence, without even a semblance of proof, and utterly innocent of the charge of probability. Their continuance consists in the fact that they can be neither proved nor disproved, and consequently one person has as much ground for believing in them as another has for considering them to be entirely false. They usually treat of subjects that are practically beyond the reach of the experimenter with his measuring line and balance, and beyond the ken of the observer with his microscope and telescope. Prominent examples of this numerous class are Le Sage's theory of the cause of gravitation, and C. W. Siemen's "New Theory of the Sun and the Conservation of Solar Energy." It is, of course, impossible to say that these efforts are not in the right direction. But if judged of by analogy, and especially if brought into contrast with the necessities of the case and with known facts, these, and others like them, appear to be lamentably deficient. They may serve a good purpose in some cases and with a few individuals, but in general they cumber the ground and cause a waste of energy.

CORRESPONDENCE.

LETTER FROM TEXAS.

MARCH 6, 1883.

EDITOR REVIEW OF SCIENCE AND INDUSTRY:

Last October while on my way from San Antonio, Texas, to Fort McKavett, I was detained at Mason, one day, until long after midnight, to make connection with the line of stages running from Burnett. The printers were working on the *News Item* that night, and the proprietor very kindly invited me to spend the time in his office, as it was uncertain when the stage might arrive, and they would not wait for passengers. I spent most of the night very pleasantly talking with Mr. Stimpson, who was formerly a resident of Kansas, but is now engaged in mining in Texas. We discussed at length what plan we ought to pursue in order to develop the mineral resources of Texas, to diffuse scientific intelligence and to create a scientific spirit among the people. Among other things Mr. Stimpson stated that he believed he had discovered tin ore, and offered to send me samples if I would have the matter determined by competent chemists.

In accordance with this plan, several weeks later, I received three samples

from three different localities, of alleged tin ore, with some other minerals, for assay. I sent one specimen of the alleged tin ore for analysis, to each of the following chemists: Prof. G. E. Patrick, State University, Kansas; Prof. G. H. Failyer, State Agricultural College, Kansas, and Prof. Chas. A. Schaeffer, Cornell University. In due time I received replies from all these chemists. Prof. Failyer wrote that the specimen sent to him was a first-rate specimen of garnet. Prof. Patrick wrote that the specimen forwarded to him was a fair specimen of oxide of iron.

Prof. Schaeffer, of Cornell University, wrote me at some length, about the alleged tin ore and the other specimens forwarded. He says in substance:

"As to the specimens you forwarded, I am sorry to say, I shall have to give a very unfavorable report. The tin ore, from Burnett County, contains no tin, and consists of garnet. The cinnabar, from Gillespie County, is very good looking hematite. And the lead and silver specimen proves to be a chunk of metallic lead with only a trace of silver—just about as much as is usually found in all commercial samples. The small fossils are casts of the interior of some species of the genus *Turritella*. As the sub genera and species are distinguished by the external markings of the shells and the shape of the mouth, it is impossible to name them any more definitely. The genus extends from the Silurian to the present time. Prof. H. S. Williams, thinks, however, that the specimens in question are probably Cretaceous.

"In spite of the foregoing I shall always be happy to assist you to the extent of my power in your efforts to develop the hidden resources of Texas. During the past year I had some experience in that State which was quite interesting. Early in the year I received a number of specimens of limestone which I found contained gold, some of them being quite rich. The result of the matter was that I was sent there to investigate, and spent about six weeks in June and July in Williamson County. The particular point of my operations was about eighteen miles north of Georgetown, very near the border of Bell County. I certainly found gold, but came to the conclusion that there was very little prospect of finding enough to pay. I have written a brief paper on the subject to be read at the next meeting of the mining engineers. I have no doubt that there are vast possibilities in the State. The hematite you sent, by the way, looks like a very pure article, and as soon as I can find time, I shall make a complete analysis of it. I fear though that the point where it occurs is so far from any iron works, that it will not amount to much financially."

Nature unfolds to the observer in Texas a wonderful variety and luxuriance. The mineral resources of the State are known to exist in almost unlimited quantities. But we have no geological survey, and I have received so far very little encouragement in trying to repeat my work in Kansas and Missouri in founding an Academy of Science. I am satisfied, however, that such a society could be organized in due time, after enough hard work. If Texas had an Academy of Science, composed of active scientists, in various parts of the State, it would exert

a powerful influence in molding the people, and in inspiring them to prosecute scientific investigations.

I only wish to add, that it will afford me pleasure to assist any miners in the State in securing analyses of alleged tin ore. Tin is now found in Alabama, and it is probable that it also occurs in Texas, as miners generally believe.

Very truly, JOHN D. PARKER.

LETTER FROM SCHLIEMANN.

ATHENS, January 20.—In a letter headed "The Archæological Discoveries in the Levant," dated Athens, 18th ult., and published in the *Times* of the 10th inst., it is stated that "the resumption of my excavations at Hissarlik has failed to develop anything confirmatory of my Ilian hypothesis, and that the famous stratification of civilization which was supposed to testify to the extreme antiquity of the city is shown to be untenable." The anonymous writer is evidently no archæologist; moreover, he does not speak of my excavations from personal inspection, nor does he seem to have the slightest knowledge of what has been written on the subject since August last.

I excavated in 1882 for five months—namely, from March 1 till August 1, employing all the time 150 laborers, and aided by two of the most eminent architects of Europe, Mr. J. Hoffer of Vienna, and Dr. Wm. Dorpfield of Berlin, the latter of whom superintended for four years the technical part of the excavations of the German Empire at Olympia. Not only have these excavations been no failure, but, on the contrary, they have yielded far more important results than all my previous excavations at Hissarlik since 1870. The success of five prehistoric and two latter settlements, as given by me in "Ilios," is confirmed by my architects (see Dr. Dorpfield's letter in the *Augsburger Allgemeine Zeitung* of September 29, 1882, and an extract of it in the *Academy* of October 14) who have, however, proved to me that the enormous masses of calcined debris, which I had attributed to the third city, really belong to the second city, which perished in some fearful catastrophe, and which had on the hill of Hissarlik only its Pergamus, with five or six edifices of very large dimensions, while its lower city extended east, south and west on the plateau.

We have excavated most carefully all the buildings of the Acropolis, among which two, of very large proportions and with walls respectively 1 meter 45 and 1 meter 25 thick, seem to us, for many reasons, to be temples. Nothing could better prove the great antiquity of these buildings than the fact that they were built of unbaked bricks, and that the walls had been baked *in situ* by huge masses of wood piled upon both sides of each wall and kindled simultaneously; each of these buildings has a vast vestibulum, and each of the front faces of the lateral walls is provided with six vertical quadrangular beams, which stood on well-polished bases, the lower part of which was preserved, though, of course, in a calcined state. We, therefore, see that in these ancient Trojan temples the *antæ*

or *parastades*, which in later Hellenic temples fulfilled only a technical purpose, served here as an important element of construction, for they were intended to protect the wall ends and to render them capable of supporting the ponderous weight of the super-incumbent crossbeams and the terrace. We found similar primitive *antæ* in two other edifices, and at the lateral walls of the northwestern gate.

We also found that the great wall of the ancient Acropolis has been built of unbaked bricks, and had been baked like the temple walls, *in situ*. I lay stress on the fact that a similar process of baking entire walls has never yet been discovered, and that the *antæ* in the Hellenic temples are nothing else than reminiscences of the wooden *antæ* of old, which were of important constructive use. We discovered in the Acropolis of the second city three large gates, all of which led down to the lower city. Homer knew of only one gate at Troy (the Scæan, sometimes also called the Dardanian Gate), but this gate was on the west side of the lower city; the gates of the Pergamus are never mentioned in the poems. The three prehistoric settlements which succeed each other in the calcined ruins of the Acropolis were poor and insignificant, and none of them extended beyond the hill of Hissarlik. The ruins of the lower city, therefore, remained deserted for ages, the bricks crumbled away, and the stones of the walls served the new settlers of Hissarlik for building their houses, or, as the legend ran (see Strabo, xiii, 599), they were used for building the walls of Sigeum.

The site was in later times occupied by the Æolic Ilium, which stood for more than 1,000 years, but nevertheless the traces of the ancient burnt city have not been obliterated; the huge masses of prehistoric pottery, perfectly identical with that of the second city on the Pergamus, which were found in the extensive excavations made by me on the lower plateau, testify to its existence on the spot. Its existence seems further to be proved by the vertical wall represented in "Ilios," p. 24, N. 2 B., as well as by the three gates, and above all by the ground plan and the number of loose edifices in the Pergamus. I have now excavated the latter entirely, and for this reason alone the excavations at Troy must be considered as terminated forever. I have also excavated seven more of the conical tumuli, called heroic tombs, and have thoroughly explored the ancient city on the heights of Bunarbashi, as well as the sites of four other ancient towns.

A full account of this, my last Trojan campaign, with excellent plans and about 200 engravings of the most curious finds, will be published by Mr. John Murray.

HENRY SCHLIEMANN.

EDUCATION.

FOURTEENTH ANNUAL GRADUATION EXERCISES OF THE KANSAS CITY MEDICAL COLLEGE.

The fourteenth annual Commencement of the Kansas City Medical College was held March 7th in the auditorium of the Walnut Street M. E. Church. The church was filled with friends of the college and the class, and others interested in the proceedings.

The music was furnished by the Opera House orchestra, and was of an excellent character.

After an overture from "Zampa" the evening's exercises were opened with prayer by Rev. C. C. Woods. The orchestra discoursed several selections from "Ernani," and Rev. C. L Thompson was called upon to deliver the address of the evening. Dr. E. W. Schauffler, president of the faculty, presided over the commencement exercises. The members of the faculty occupied seats on the rostrum.

NATURAL SCIENCE AND PSYCHOLOGY.

In his address to the students of the College and the members of the graduating class, Rev. C. L. Thompson spoke as follows:

A minister is to speak to you, young gentlemen, on the threshold of the medical profession. At first thought it might seem inappropriate. I might be warned off this ground by the old saw: "*Ne sutor ultra crepidam.*" But in these days the shoemaker's last stands for more than one thing. The realm of learning has so widened, the circles of learning, like those of the skies, so cut each other, that each is kin to all. The professions are articulated and each belongs to all. It is especially so between us. You are doctors, I am a minister. We are each at a work upon the same man. Therefore I have a right to speak to you—you have a right to speak to me. We are building on the same house, a house not made with hands. If we build wisely, we will build together, each in loyalty to the one plan of the architect.

When a pseudo doctor works away at the symptoms or special form of disease without taking account of the whole man, you call him a quack. You disfellowship him. Let us beware that you and I be not quacks of a higher sort, but quacks all the same; you doctoring the man's digestion and respiration and circulation, and ignoring his mental and moral condition, and I, doctoring his conscience, while I ignore his liver. A full science takes in the whole man.

So, young gentlemen, in proportion as we are scientific, we are brethren.

Indeed, we must be specialists. Only a fool will think in a score or two of years he can learn enough to doctor a whole man. Remember the German professor who lamented on his death-bed that he had been fooling away his life by studying, or attempting to study, the whole Greek alphabet. If he had another chance he would devote his entire life to the study of the one letter "Iota." And remember what Dr. Holmes tells us of the professor at the breakfast table who had scattered and wasted his energies by devoting them to a study of beetles. If he had life to live over again he would devote his time to the study of the hind leg of one class of beetles. One can sail around the world, but in so doing nothing is discovered. The ocean is only an empty desert. But cast your anchor. Let down your bucket, and out of that bucket select one trembling drop of water and put on your spectacles, Oh! microscopist, and the heavens and the earth seem to be open under your concentrated gaze. So we must be specialists because we cannot successfully be generalists. The Bible says, "the eyes of the fool are in the ends of the earth." So he sees nothing. The earth has no ends. The eyes of the wise man will be at home selecting one thing from the infinite multiplicity of nature and magnifying it by a concentrated attention until it becomes "the deputy of the world." That is genius, and that faculty of absorption in one thing makes the scientific man and the worthy scientific result.

But while this much in favor of specialism must be conceded to the largeness of the world, there is also a great truth on the obverse side. The specialist who gives himself to one part of the body needs to form a partnership with other specialists who give themselves to other parts of the body. The oculist needs to be sympathetically joined to the aurist, for if the whole body were an eye, where were the hearing? and if the whole body were an ear, where were seeing? Thus specialties supplement and complement each other. But now the man is not all body. He has something besides physical organs.

The physical specialties need an ally. You want to take me into partnership. *Sana mens in sano corpore.* We can hang out no shingle of a universal doctrine. We distrust the medicines that cure everything. But we can hang out a broad sign, on which shall be written the names of the great firm of Dr. Corpus and Dr. Mens. Drs. Corpus & Mens, Professors in the Institute of Humanity; their partnership bodes great good to the future of humanity.

And as between them there need be no jealousies. Is there any truth in the sometimes slanderous affirmation that doctors have long coat-tails—that are easily trodden upon—that they balance professional chips on their shoulders and are jealous of their special prerogatives? I trust so. A man who is not sensitive to the honor of his calling is not worthy of a place in it. A proper professional dignity befits alike the doctor of medicine and of theology. I know a doctor of medicine, who being recently called to attend upon an intelligent lady, was met by the feminine caveat, "Doctor, you must stipulate that you will not give me any quinine, morphine or calomel." The doctor, seeing with alarm the pharmaceutical ground thus rapidly narrowing under his feet, exclaimed with becoming dignity, "Madam I am not going to take you into partnership with me in the

practice of medicine." That was all right, because both the doctors of that firm would have been in the quinine, morphine, calomel department, and that might have caused a collision.

But, young gentlemen, you have got to take me into partnership with you. For you, without me, will not cover the whole man. If the whole body were an eye, where were the hearing? If the whole man were a body, where were the soul? Specialists of the physical department of humanity, you need the preacher. It will be the sign of a broader science when you leave room on your shingle, and in your theories, for him, the doctor of souls.

I think there only are two grounds on which you can resist the partnership for which I am pleading.

First.—You can say there is no second department. You can say a man has no soul; or, if he have what, by courtesy, may be called a soul, it is only refined and sublimated matter. It bears only such relation to the grosser body as the sunbeam bears to the lump of clay it beautifies—matter—only in another form. Precisely this a great many doctors are saying. They deny the duality of life, they run their craft against that philosophic current which has the sweep of all historic time in its movement; that stream which sprang from beneath the porches of the Athenian academy, and flows with accepted music through all schools of thought the affirmation, viz. of a dual nature in man. This you can do. You can build the man up from protoplasm. You can say I am a lobster, converted for the nonce into what is called a man. If I should be drowned lobsters will quickly reconvert me into lobsterian protoplasm. You can say, as Huxley said in a lecture on the physical basis of life, "All vital action may be the result of the molecular forces of the protoplasm which displays it. And, if so, it must be true in the same sense and to the same extent that the thoughts to which I am now giving utterance and your thoughts regarding them are the expression of molecular changes in the matter of life, which is the source of our other vital phenomena."

Now, when you adopt that creed, that there is but one thing in the universe, and that one thing matter, when you have thus remanded to the same protoplasmic base, the fungus that clings to the rock, and the thoughts of Plato, or John Milton (thoughts that wander through eternity) you are then ready to dismiss the preacher. The partnership must be broken up. If you have ever admitted the mind doctor into your counsels you may get rid of him at once. He is only an impertinence. He stands for an unreality. He is only painting pictures which death's dust will pretty soon quench.

I will not say if this is your theory that your calling is worth nothing. It is worth while to soothe a toothache to day, though the tooth may have to be pulled to-morrow. But I will say that so your profession is robbed of its chief grandeur. You are not serving an immortal being. Your work has no immortal projection. It is not a parabola, whose unfinished curve points past the stars. It is like the curve of a broken rainbow, one end of it veiled by a storm, and the other end shooting down into the ground. And you who work at the ground end of the bow

may possibly find the pot of gold. But you shall have no higher reward. On this theory you and the horse doctor—the veterinary surgeon, and the veteran surgeon of human bodies, may as well go into partnership and hang out your sign together.

Or, second, you can resist the partnership for which I am pleading on quite another ground. Instead of being a monist, and holding to only one substance and that substance matter, you may be a dualist of such extreme pattern that you will say "there are two things, mind and matter, and they are so far apart that the one has no connection at all with the other." You may say, "I will doctor the body and you, preacher, may doctor the soul. Our fields have nothing in common. Calomel and catechism have no relations. There is no reason why either profession should consider the other."

And yet, whatever theories of the entire dissimilarity and non-connection of these two professions you may hold at the beginning of your calling, I believe you will modify them as you go on. You will gradually discover that calomel and catechism have points of contact. Perhaps you remember of a broken bodied and broken-hearted man who went to an eminent French physician to be cured of something, he knew not what. He seemed hopelessly low spirited. The doctor, after various experiments, concluded that his patient needed mental not physical stimulus, and advised him to go and hear a distinguished actor who at that time was convulsing Paris with his comic performances. "Alas!" replied the gloomy sick man, "I am that actor." And then the doctor was nonplused. But he was wise in his prescription. He recognized the subtle connection between brain and thought; between heart and hope. The minister of large experience knows very well that often he comes to the point where he must say to his patient, "Go to the doctor; there is no chance of your getting a good hope of heaven till your liver is cleaned out." A hopeless kind of battle the religious leader is fighting when he puts comforting doctrines against confirmed dyspepsia. Dr. Alexander used to say he always had a good hope of heaven except when the east wind blew. Many another would be a serene Christian if only a villainous digestive system would let him. On the other hand, some of these experienced physicians have often reached the French physician's point, where they were ready to surrender physics to philosophy, where, across the shadowy borderland between the physical and the spiritual, strange influences reached from the latter to the former, neutralizing the effect of medicine, suspending natural law, and introducing into all professional calculations abscure and confused and confounding conditions.

So I believe the last words of science on this subject are these two:

First—The proper duality of human nature, a body that is not the mind—a mind that is not mere bodily effloresence.

Second—A closeness of connection and sympathetic action between the two of the most intimate kind; so intimate as to palliate the error of those who under a sense of their identity forget their difference.

I venture to propose therefore to you, young gentlemen, as a supplemental

course of study, (for the true physician is a student to the end of the chapter) an examination of the borderland of your science; the influence of psychic states on physical conditions. I believe we are beginning to get some lights for that shadowy realm, and that by those lights the reverent student will be able to walk forward to many results that will greatly aid the practice of medicine. I have observed that a good deal has been said lately of the importance of having medical students better prepared in general knowledge—especially in fundamental natural science—before they begin the study of their profession. Thus they would lengthen your course at the beginning of it.

And I would lengthen it at the other end, where it reaches up into psychology. For you are to doctor a man who has a soul of such dominant activity that it often affects most profoundly and even commandingly that physical basis on which your science is to work.

That study is an obscure one, but it is one of rising importance; importance both to the preacher and the doctor. To the preacher, for I must know what checks and reactions my doctrines will meet when they impinge on a disordered or cantankerous physical system. And to the doctor, for he must know what allowance to make for those intangible and imponderable agencies, that like spirit hands manipulate his drugs, now paralyzing their action and again intensifying it beyond computation.

Young gentlemen, you have a great profession, because it involves the care of an immortal being from the ground up. You have not compassed it, when you have found specifics in nature's pharmacy for the ills of the flesh. I think specifics more and more retire from the advance of true science, because science gets comprehensive, and every prescription must contemplate the entire man. If you work away at this or that symptom without intelligent vision of all that being which the symptoms inhere, you are only tinkering. So study the whole of that being; sometimes to get at a man's physical condition it is as necessary to sound his conscience as it is to tap his lungs. "A bad heart" is a phrase that has two meanings. Those meanings may be related, and each be interesting to the physician.

One word more as to those upper ranges of your profession. You and I are servants of mankind. Victor Hugo somewhere says, "the priest's door should always be open, the doctor's door should never be shut." We cannot be true to our calling and wall ourselves into our own pleasures or our own comfort. We are not in the highest view scientists, we are not money makers, we are not ambition hunters. We are missionaries. A sort of divine obligation pushes us on. If we realize the grandeur of our calling the world's praise or blame glides past us like the idle winds. We have a ministry, and among bruised bodies and bruised spirits we are as those who serve. Now to serve—not a principle, and not a creed, and not a school, but a living and deathless being we need a certain poise of character and tenderness of touch, which comes only from contact with calming and ennobling spiritual virtues. Therefore you need not only to remember that

your patient has a heart and a conscience, but you need them yourself. If you would be an expert surgeon your professors have told you you must do nothing to unsteady your hand. Only so can you move successfully around those centres of life, where a manual tremor might be fatal to your work. My old friend, Dr. Mussey, of Cincinnati, when he had a very delicate surgical operation to perform, would go to bed for a day, that with a rested system and unjaded brain and a level hand he might come to his perilous task. Young gentlemen, I commend to you that restfulness of spirit, that best balance of all your powers which comes from the silence and calmness of leaning on God. This will help you to do your work to the best. You will interpenetrate the physical with the spiritual. You will carry a serene, a cheerful countenance that is sometimes better than medicine. An element of helpful sympathy, undulled and unprofessional, will accompany and glorify your ministry to the body; your heart will be kept true to the highest sentiments of your calling, and your faith in God will sustain you under the failures with which human mortality steadily confronts you; but if you work on high levels, it cannot cheat you of your reward. That reward will not always be to save life. It will be enough if, joining hands with the minister, you teach a man how to die; teach him how along the altar stairs of a breaking body, to climb through this world's darkness up to God.

After music President Schauffler conferred the degree of Doctor of medicine on the members of the graduating class, giving each his diploma and administering the usual Hippocratic oath.

The names and addresses of the members of the graduating class are as follows:

Graduates in medicine—Henry P. Ball, Shawnee, Kas.; Samuel R. Coates, Kansas City; Charles M. Chambliss, Bozeman, M. T.; Joseph S. Fisher, Middleport, O.; Charles E Griffith, Rose Hill, Mo.; Alexander H. Ironsides, Kansas City; Edwin T. Phillips, Manhattan, Kas.; Henry E. Pitcher, Shawnee Mound, Mo.; James R. Ladd, Cambridge, Mo.; Richard P. Walker, Platte City, Mo.; John B. Wann, Harrisonville, Mo.; William H. Young, Spring Dale, Ark.

Graduates in dentistry—David C. Lane, and Joseph P. Root, Jr., Wyandott, Kas.

President Schauffler then said that while this was the fourteenth annual anniversary of the Commencement of the Kansas City Medical College, it was at the same time the first annual Commencement of the Kansas City Dental College, or dental department of the Medical College. Unfortunately this fact has not been mentioned in the programme. The degrees and diplomas were conferred on the members of the graduates in dental surgery, and Dr. T. B. Lester arose to deliver the address to the class.

DR. LESTER'S ADDRESS.

Dr. Lester said that thirteen years ago it devolved upon him to speak the

parting words to a graduating class going out into the world to perform their duties as doctors, even as was the class he now addressed. The speaker reverted to the time when the Kansas City Medical College was started. It had succeeded against some opposition and under many difficulties. The good people of Kansas City had always been the friend of every enterprise that claimed Kansas City as its home, and this was the secret of her greatness.

During the existence of this college it had graduated 124 physicians. They were scattered all over the United States and Territories. The college was proud of them, and they had all been an honor to her. The speaker did not think the present class would tarnish this record.

Turning from this subject, Dr. Lester called the attention of his hearers to the great changes in medicine which were going on. The science of medicine was becoming more accurate every day. These advances all accrued to the interest of the people.

The arrest of experimental research by legal interposition was severely commented upon. Man himself killed animals for food and clothing, made slaves of them and slaughtered them for amusement. In England this fanaticism most prevailed. It had not yet reached America. No one but a fanatic would cry out in favor of a dog or a cat and oppose scientific vivisection with law, if by the experiment something might be learned which would benefit thousands of men and women.

The speaker urged his class not to fall into the error that they had nothing to do but to absorb the knowledge thus gained in the past. They must go on and enlighten the world themselves. Another error was the thought that there was nothing else to be done. Science may make more advancement in the future than it has in the past.

Despite the fact that American students of the past, in a new country where colleges were few and books scarce, had struggled under difficulties of every kind, yet the country had produced a race which were giants in medicine. The medical men of the United States were admired all over the world.

It was not necessary to go abroad to learn thoroughly the science of medicine. In the great schools and hospitals of both Europe and America, only that practice could be gained which would make a great surgeon. Europeans had made great concessions to us, and we had always admired their thoroughness and ability in surgery and medicine.

To the graduating class Dr. Lester, in conclusion, addressed words of good advice and hearty sympathy. He urged them to be true to their profession and themselves, and bade the class, on behalf of the faculty, God speed and good-bye.

The awarding of prizes was next in order. There are several prizes in the gift of the college. The first of these is the Holden prize of $100, given to the student who passes the best examination. The prize was founded by Howard M. Holden, of this city. Besides this there is the faculty prize of $25, given to the next best student. Dr. Halley, professor of surgery, offered a competitive

prize, consisting of "Agnew's Surgery," in two volumes, to the best student in surgery, and Dr. Fryer, professor of diseases of the eye, offered a fine opthalmoscope to the best student in his classes.

The prizes were awarded as follows:

First—Holden prize of $100, to Edwin T. Phillips, Manhattan, Kas.

Second—Faculty prize of $25, to Samuel E. Coates, Kansas City, Mo.

Third—Agnew's Surgery, two volumes, to A. H. Ironsides, Kansas City, Mo.

Fourth—Opthalmoscope, to D. P. Walker, Platte City, Mo.

With a concluding selection by the orchestra the members of the class received the congratulations of their friends, and the audienence dispersed.

After the commencement exercises were concluded the faculty of the college, together with the graduating class and the members of the alumni association, adjourned to the Centropolis Hotel, where everything was waiting and an excellent banquet served.

SECOND ANNUAL COMMENCEMENT OF THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF KANSAS CITY.

A large and brilliant audience gathered at the Walnut Street M. E. Church, March 13th, on the occasion of the Commencement exercises of the University of Kansas City. The platform was filled by a number of the most prominent citizens, notably: Hon. T. B. Bullene, Rev. Dr. Mathews, Dr. J. W. Jackson, chief surgeon of the Missouri Pacific Railroad; Judge H. P. White, Drs. A. Jamieson, N. H. Chapman, E. R. Lewis, J. Miller, J. P. Jackson, F. B. Tiffany, Willis P. King, J. M. Allen, Judge R. E. Cowan, Drs. A. P. Campbell, C. W. Adams, J. R. Snell, H. T. Hereford, James M. Wood, G. W. Davis, W. M. Lewis, L. A. Berger, O. Baldwin, and J. M. Wilson.

The exercises began with an overture from Stradella, which was exceedingly well rendered. This was followed by prayer by Rev. Dr. Mathews, at the conclusion of which the diplomas were presented by Mayor Bullene, who said that it was expected that Governor Crittenden would honor the occasion and himself by presenting these diplomas. It occurred to him that some were born great, and some had greatness thrust upon them. This was his fate to-night. He believed that it was the practice upon such occasions for the president to say something. If this address was delegated to him it would be a custom more honored in the breach than the observance. It was with pleasure that he could testify to the exceptionally severe test which the class had undergone, and to the exceptional triumph that they had achieved. The diplomas were then presented. In conclusion the mayor urged the young gentlemen to be worthy of Kansas City, their country, their alma mater and themselves.

The graduating class, whose names follow, then received the diplomas in the order given:

Dupuy Snell, Clay County, Mo.; John W. Gossett, Paola, Kas.; Frank A. Caughill, Chamois, Mo.; James E. Logan, Kansas City, Mo.; Albert F. Schmitz, Sedalia, Mo.; Eugene L. Friedenberg, Kansas City, Mo.; Alexander B. Peters, Salem, Kas.; Grayson B. Scholl, Girard, Kas.

The following prizes were then awarded.

Surgery—Professors J. P. Jackson, M. D., and J. W. Jackson, M. D., given to the one attaining highest grade. James E. Logan, A. F. Schmitz and Dupuy Snell having each attained the same grade, each was presented with a copy of "Bryant's Surgery."

Obstetrics—Prof. H. T. Hereford, M. D., prize awarded to F. A. Caughill.

Eye and Ear—Prof. Tiffany, M. D., first prize, E. L. Friedenberg; second prize, Jas. E. Logan.

Orthopædic Surgery—Prof. J. Miller, M. D., prize awarded to E. L. Friedenberg.

Anatomy—Prof. E. R. Lewis, M. D., prize awarded to Dupuy Snell.

At the conclusion of the distribution, the orchestra rendered selections from the "Merry War." Dr. James Elmore Logan then delivered the valedictory address. Mr. Logan began with Pope's well known lines:

> "Know thou thyself; presume not God to scan.
> The proper study of mankind is man."

If this be truth, as it undoubtedly is in ordinary life, how much more is it true as regards the physician whose study is this intricate body of ours? Who deals with life itself? The speaker depicted the responsibilities, etc., of a physician's life; contrasted the profession with others, and closed by thanking the faculty for their kindness to the class, and by a few words of admonition to his fellow students.

In an eloquent address the valedictorian reviewed the work done by the class and the life work yet before them. The faculty were again warmly thanked for their efforts in behalf of the instruction of the class, and the speaker closed his address with a few well chosen words of advice and farewell to his fellow graduates. The valedictory was warmly received by the class and the audience, being frequently interrupted by applause.

MACHINE SCIENCE.

Col. Theo. S. Case then delivered the following address:

LADIES AND GENTLEMEN:—For some years past we have been accustomed to hear very frequently the expression "machine politics;" more latterly the phrase or term "machine education" has been launched forth. In the one case it is applied to the management of political affairs by systematic party discipline or drill, by which, to a certain extent, at least, the will of the individual voter is subordinated to that of his party leaders. In the other, it is used to describe "the rigid, mechanical, law-established routine" applied to the education of children in the public schools of some of the States.

In either case the same benefits and the same evils flow out of the system. Great cumulative force and power are attained, and a high average degree of excellence and success results. At the same time the process may not be exactly adapted to every individual voter or pupil. The objection is that by such machine management the important elements of individual judgment and self-reliance are left out of the question. It is a system of forced results rather than of independent action. But it is not alone in politics and education that we find the machine at work. It pervades every branch of business, and may naturally be looked for in mental processes also. Professor Bain, in speaking of the early history of the English universities, refers to "the fatal sterility of the middle ages and of our first and second university periods, which had to do with the mistake of gagging men's mouths and dictating all their conclusions. Things came to be so arranged that contradictory views ran side by side, like opposing electric currents, the thick wrappage of ingenious phraseology arresting the destructive discharge." Though we must repudiate "sterility" as a factor in our day and in our institutions, yet we may do well to examine our processes of thought and investigation and see if we are not tending, in some respects at least, to a similar position in scientific matters.

Many illustrations, pointing suggestively to this tendency, might be furnished; but one, which is exceedingly prominent, will suffice for this occasion.

The year 1882 will long be remembered as one of unusual mortality among distinguished literary and scientific men. We were, within its brief compass, called upon to mourn the loss, successively, of such men as Darwin, Draper, Emerson, Marsh, Longfellow, Pusey, and others almost equally eminent in their different lines of labor and usefulness. Of all these, however, probably none left so many admirers or so lasting a fame, certainly none made so marked an impression upon the thought of his generation, as Charles Darwin.

When he died, last April, the naturalists, the philosophers and the theologians of both hemispheres united spontaneously and almost involuntarily in rendering tributes to his memory. All awarded him, unhesitatingly, the character of a fair-minded and careful investigator, a scrupulously honest and faithful recorder of intelligently observed facts, and a conscientious and logical generalizer. To him more than to any other student of nature of the present century is science indebted for a reasonable and probable theory of the origin and descent of species, and upon his head was poured a larger share of criticism, opposition, even personal ridicule, than has fallen to the lot of any other writer during the same period of time. On the other hand, no other writer has ever received from his followers and during his lifetime, so large a meed of praise as the constructor of a theory of development which, it is claimed, has within less than twenty five years "reformed science and constrained the whole perception, thought and volition of mankind into newer and higher courses."

Darwin's theory was not altogether new, for it had been broached many years before by Lamarck in his "Philosophie Zoölogique." In fact, Aristotle, himself, suggested it more than 2,000 years ago, while quite a number of com-

paratively modern investigators, including his own grandfather, Erasmus Darwin, had discussed it before he published his first work upon the subject in 1859. But at just about that period in the history of science, the geologists, biologists and theologians had somewhat harmonized their differences and disagreements, and there was comparative peace. Consequently, when the development theory was promulgated, great excitement ensued. It ran counter to established beliefs and convictions, arousing the most vehement assaults from all sides. However, the more it was combatted, the more it was brought into prominence and its claims tested in the light of investigation and philosophy, the better its facts, premises and conclusions were understood, and the stronger hold it took upon men's minds, until to-day, though not even yet demonstrated, it is more generally accepted and approved than any other.

This theory is known indifferently by the ordinary reader as the development or evolution theory, and, as opposed to the theory of special creation, may be defined to be an explanation of the processes of nature in originating and perpetuating life upon the earth by evolution, or by the derivation of one species from the one preceding it; modified by the attendant circumstances or environment.

It appears very clear to a great number of the leading naturalists of the world that the adoption of such a theory need not affect men's belief in a prime originator or Creator. On the contrary they deem it only a stronger evidence of his wisdom and power, that He was able to animate the first atom or germ of organic matter and give to it the potentiality to develop, by innumerable steps or grades, and through an immensely prolonged period of time, from a moneron into a man. Such thinkers are known as theistic evolutionists. There are, however, other thinkers and investigators who assume that the processes of development are entirely independent of any divine originator, and that they are self-originating and self-existent. These are styled atheistic evolutionists.

It is not the object of this address to discuss the facts of the evolution or development theory, but simply to inquire what effect, if any, its various phases (for it has received many alterations and additions,) are having or may have upon students of any branch of science requiring physical investigation or philosophic examination. Such an inquiry seems to me eminently proper at this time, in view of the fact that the officers of the University of Kansas City contemplate the establishment of its other departments very soon. Professors in other branches will shortly have to be chosen, and the welfare of the public, through its youths, is vitally concerned in this choice. It would be an excellent thing to have our university well endowed and well provided with the means of instruction, but after all it is the professors who will make the reputation of the institution and it is their teachings that will make sound and practical men or shallow dullards of our children. Mr. Hewett says, "Inability on the part of a professor to impart to a student the distinct methods and training of a scientist, or philologist or a student of history, is to pervert and misdirect the energies and often to vitiate the fruits of years of study."

The purpose of a university is to develop the intellects of its students in ev-

ery department of education, art and science that comes within its scope or function. Medical students are not merely to be taught the names and uses of bones, muscles and organs, or the practical applications of medicines, but also the subtle actions of brain and nerve; not merely anatomical structures, but the mysterious physiological processes; they are to be taught to "minister to a mind diseased" as well as to set a broken limb. Students in other departments are also to be instructed not only in the routine of practical forms, but in all the mental processes by which such forms are arrived at and made common and practical. Mr. Sill, in discussing Herbert Spencer's theory of education says: "There is a permanent aspiration in man for spiritual enlargement, for higher and richer planes of intellectual being. This aspiration has in every age reached out, no doubt more or less blindly, after whatever was greatest and best in preceding human attainment." * * * "From many desires and motives, no doubt, but most of all from this permanent hunger for intellectual illumination and spiritual enlargement have grown up our universities and our systems of liberal culture." He would be a strange teacher of medicine who at the present day would content himself with informing his class that blue mass was "good for biliousness," and that morphine was "good for sleeplessness," and fail to lay before them any explanation of the subtle and mysterious action of those agents upon the liver and brain. That was the old-fashioned, machine way of teaching, and the result was that men went through their lives bleeding, salivating and blistering their patients by rote, and deeming themselves lucky when they had thrown them into fits, for the reason that you have all heard so many times. If it had happened in the formation of the human system that the liver had been left out, such doctors, as I have heard one of our most respected and progressive city physicians say, would have been "in a mighty bad fix."

But such crude and empirical instruction has been abandoned in all intellectual communities, and every effort is put forth by professors, whether of medicine, law, science or literature, to combine instruction with investigation, and to enlarge by all their powers the bounds of human knowledge. The responsibilities resting upon them are not easily measured. In these days of unsettled beliefs the importance of furnishing young men with a firm foundation of classified knowledge and of well balanced habits of thought cannot be overestimated. A failure to accomplish this in our universities is not only to perpetrate an inestimable wrong upon the students themselves, but to do more or less permanent injury to the cause of education in the community. The one object to be kept in mind by all earnest and faithful instructors is the exclusive pursuit of the truth in whatever line of study they may be engaged, and this is to be done by adherence to facts, known and resulting from investigation, and by the generalization of the facts in exact accordance with the laws of reasoning and thought. These precedent points being fully established, the professor need have no hesitation in taking his pupils wherever logic leads. Truth thus sought will bear exposure under all circumstances.

This brings us back to Darwin again. His theories have become so com-

pletely commingled with the scientific and philosophic thought of the day that scarcely any investigator in natural science, especially in the domains of zoölogy, geology, botany or anthropology, has failed to be affected by them. The phrases "natural selection," "evolution," "origin by descent," "the survival of the fittest," are as common as household words, and, without stopping to consider the differences between these divisions of the general theory, I proceed to discuss the bearings of university teaching upon the questions of theistic and atheistic evolution. The influence of the theory itself will be felt in the investigation and study of almost every branch of science, and nearly every professor will be compelled to give to his classes a reasonable account of the opinion he entertains regarding it, and this opinion will or should naturally give at least a bias to their subsequent thought and labors.

Now, while natural science has not yet been able to prove the correctness of the evolution theory by facts, and has been obliged to call philosophy and metaphysics to its aid to work out a plausible demonstration of its claims, still evolution is so widely admitted to be the most probable explanation of the processes of nature that it will be adopted by future scientists, at least as a guide in their investigations. Consequently, the question to be settled first of all seems necessarily to be whether the true path of investigation lies in the theistic or the atheistic acceptation of the theory; whether we are to regard an infinite God as the originator of the world and the designer of the processes of development in the organic and inorganic kingdoms, or whether we are to adopt the doctrine of the atheistic evolutionists, who deny the supernatural or creative origin of man or any of the animals, and account for them all by attributing their origin to spontaneous generation and their subsequent development solely to the operation of law.

Taking up first the consideration of the atheistic line of thought and argument, and passing over the question of spontaneous generation of life, which the experiments of Tyndall, Bastian and others seem to have answered negatively, but assuming it to be possible, for the sake of the subsequent argument, we come to the consideration of development by law. Now law, as understood in science, is inexorable and inflexible, exact and complete. The law of gravitation is so exact in its requirements and fulfillments that the movements of the most distant planets or other heavenly bodies can be calculated with the utmost accuracy, whether we reckon centuries backward or forward. The laws of chemical affinity are so precise that the most minute quantities of any given substance can be detected with exact certainty, while the proportions of the constituent elements of any known compound, base or acid are utterly invariable, and their combining equivalents unalterably fixed. Any violation of these laws, either by error in calculation or misapplication of their rules, inevitably results in failure to attain the object sought. Every true calculation, in the one case, or correct combination of chemical equivalents, in the other, will produce identically the same result, even if repeated a thousand or million times. This should be the case with all laws; when once discovered and formulated, they should stand forever, immutable, invariable and unyielding.

No scientific man questions the reign of law in organic nature any more than in mathematics or physics, hence the two questions for teachers and students of science to consider are what really is law, and whence the law. These being definitely settled, the field is clear and the goal within certain reach.

Now, again admitting what has not been distinctly proven, that the laws governing development of species have been discovered, let us ask what will be the result upon young investigators when they are taught by their trusted instructors that these laws are self-evolved, self-existent and self-operative? That they began just after chaos, have been operating inflexibly ever since, and will continue to rule irresistibly, unchangeably and relentlessly until the end of time? What must be the necessary effect of the knowledge or the credulous belief in the existence and enforcement of such unbending, rigorous, cast-iron laws? As Schmid puts it, he (the investigator) sees "all the rich treasures of human life and history become a result of blindly acting forces; the history of the world, ethics and all spiritual sciences are, in the progress of perception, dissolved into physiology, and physiology into chemistry, physics and mechanism." Can a student see anything to hope for such, under rigid, cramped and inelastic conditions? Will it not appear to him useless to investigate, to try to get at the causes and effects of the phenomena he perceives around him?

If these assumed laws of the atheistic evolutionist actually are laws, with no elasticity and with no superior to control or modify them, then all thought necessarily turns back upon itself, and the fatalism of Buddha is the result. All things, past, present and future, are immovably and unchangeably fixed. Law rules; human effort and skill and energy avail nothing. Development goes steadily, irresistibly, ruthlessly onward. Active and powerful, but lifeless and soulless, it tends neither upward nor downward, neither to the right nor to the left. Onward it goes, without ultimate object or aim; ponderously crushing out sentiment, reverence, love, faith, hope. It seems to me that this is the irresistible logic of atheistic evolution, and that the young man who accepts it as his guide in physical or philosophic investigation leaves hope behind. He sees everything in nature's processes blocked out for him in advance. He has no worthy object in view for which to strive; he mounts the machine, gets into the ruts of "the survival of the fittest" and "natural selection;" he rides between walls of adamant, too dense for penetration and too high to allow any light to fall upon from above. Even those by-paths which open dimly along his course he is forbidden to explore. Law rules; its narrow limitations allow of no divergences or digressions. The machine carries him on, he knows not where, overpowering him with its noise and force, until he becomes part and parcel of it; a mere machine himself, plodding in his methods, cramped in his ideas and routine in his practice. The machine is self-evolved, self-regulated, inexorable law, having neither intelligent beginning, intelligent aim nor intelligent conclusion, evolved by chance from chaos, developed without object or design and closing in the obscurity in which it began. It is the stultification of intellect to separate this atheistic con-

ception from its "thick wrappage of ingenious phraseology" and follow it to its legitimate and logical conclusion.

"But," say the upholders of this theistic, this Godless view of the question, "there are modifications of this law; there is a law of variability. Although this strict succession or sequence of events is absolutely required by a literal rendering of the law of development, there are some few solutions of continuity allowed." Ah? are there, indeed? Then either you have no law whatever or that law is controlled and guided by a superior power, the Great Law Maker Himself, perhaps. Exact law knows no variability; admit of a variation and your law is a nullity! Yield one inch to environment as a modifier of a single step in the syllogistic process and you give up law forever, as the atheistic evolutionist has constructed it, and as he must hold to it, if he believes his own postulates. Law let alone is a merciless and despotic autocrat.

Where have we landed? We know that the laws of development and descent are most probably true and in operation all around us. The investigations of scientists from the days of Aristotle to the present time point clearly to them. The words of the wise man in the Scriptures unmistakably point to them when he says "The works of the Lord are done in judgment from the beginning: and from the time he made them he disposed the parts thereof."

Let us turn for a few moments to the doctrine of theistic evolution. Here, according to my belief, we shall find plain sailing. Law rules as before, but the machine is gone. Flexibility, elasticity, variability, all are present, essential corollaries to the law, and in strict harmony with the design of the Creator. He could and did foresee all things from the beginning, and has provided for their development in strict accordance with law, but at the same time He guides, directs, and controls the phenomena of nature as the world progresses steadily toward the ultimate and pre-arranged goal. The soulless machine is gone and hope returns. Intelligent, free-willed man investigates, studies, contemplates, draws closer to his Maker, comprehends more and more fully the grandeur of the cosmic scheme, realizes the magnificence and brilliancy of the original plan; observes and appreciates the comprehensive precision, the facile power and the apparent ease of its execution; and now, in his turn, resorting to philosophy to supply the "missing link," his consciousness, his reason, his faith, all point unerringly to the final disclosure of the object of the Divine plan, which, commencing with God "in the beginning" has run its course with rhythmic harmony of development and only awaits the fullness of time to logically, fittingly and triumphantly culminate in the glorious after-life depicted in the apocalypse.

The discussion of such questions is, in my judgment, as strictly within the scope of university teaching as any others, and while they may not at present come as fully within the range of the course of instruction in this university as they will when the other departments are established, they certainly should be considered, and doubtless are considered, in some of the lectures before the medical classes. That eminent physiologist, Professor Martyn Paine, gives the question the most careful and profound examination in his work, the "Physiolo-

gy of the Soul and Instinct as Distinguished from Materialism." He brings to the treatment of these matters, practical experience, various and deep learning, vast research, equal familiarity with physical and metaphysical methods, and a most intimate knowledge of anatomy and physiology. His arguments against that materialism which would resolve the qualities of mind into molecular action are plain, practical and irresistible. Very few noted physiologists advocate materialism. Their researches almost universally result in opposite conclusions. They cannot ignore the law of design.

While the position I have taken may be questioned by some scientists, I have the satisfaction of knowing that such eminent geologists as Dana, Dawson and Winchell, such distinguished botanists as Gray and Braun, such learned and skillful naturalists as Wallace and Owen, and such able metaphysicians as McCosh and Braubach uphold the theistic side of the case from their respective standpoints. But it cannot be denied that the tone and tendency of thousands of investigators, and especially metaphysicians, are toward atheistic evolution. If they are correct, which seems to me impossible, we shall necessarily have to submit. We ask only for honest investigation, candid and logical generalization and reasoning, and are willing to accept the results.

Another phase of teaching which is becoming more and more necessary with the advance of science and which is especially appropriate in university instruction, and which I am glad to point out as being fully appreciated in this institution, is the investigation and study of special divisions of different branches of professional science. We must not forget that nowadays each branch of science is so extensive that to keep abreast of the progress in it alone is no light task, while to excel in it requires the exercise of all the powers of mind and body of the most vigorous person. The duties of citizenship, intelligent, useful citizenship, at present of themselves demand large stores of general information and culture, and it is a fact beyond question that a larger share of accurate and minute knowledge is required of our professional men than ever before. Hence specialism becomes a necessity before success, in all departments of scientific investigation. The nearer our knowledge can be reduced to mathematical precision, the better for the world, and this can only be reached by division of labor and systematic, logical and truthful investigation of branch by branch, subject by subject, item by item. But the specialist must not go to the extreme of overlooking the interdependence of all the sciences. If he does, he is liable to mount the machine again and get into the old ruts of routine and empiricism.

But I have said enough. We all have our duties to perform—teachers as well as students—and the problem for all to work upon, and, if possible, to solve, is how to do the right thing in the most beneficial manner to ourselves and our fellow creatures. We may never solve the problem of the design of the universe in our day. The day of its solution may never be reached by man on this earth. As Dr. Hill beautifully says: "That day ever recedes into the glorious future as we approach it. The rate of scientific progress increases from decade o decade, and yet the new problems and the new instruments for their solution

increase even more rapidly. The divine intellect can never be exhausted by the human." While this is true, each one of us can do something toward the untangling of the knot. If he cannot reduce the interweaving threads to order, he can at least hold the skein. In the words of the oldest epic poem in the English language:

> " Each of us must
> An end await
> Of this world's life;
> Let him who can
> Work high deeds ere death."

At the close of Col. Case's address the honorary degree of Doctor of Physics was conferred upon him by President Bullene, of the Board of Regents.

Dr. Willis V. King then addressed the assembly, and gave the good and bad side of the medical profession, and also a humorous description of a young physician's dream, etc. He then pictured the reality. The real life of a physician must commence in the abodes of the humble and the poor. The practice of medicine requires more courage and more devotion than that of a soldier. He spoke of the ideas prevalent as to the mystery of medicines. He alluded to popular superstitions, such as carrying potatoes in the pocket, buckeyes, etc. He described his first visit and several other incidents of his early professional life. He urged upon the class the necessity of temperance. If any man's brain should always be clear it was that of the physician. He concluded by presenting what he termed the bright side of the profession, and enlarged upon the possibilities for good in the life of the medical man. It is a sacred trust and you must be worthy of it, more is expected of you than of other men, the epidemic is the true physician's battle field. The physician who knows and does his duty is one of the noblest sights presented to men. It is the height of folly for a doctor to mix himself in anything that will impair his power for good. The physician's face should bring sunshine to the sick room. He must not be frivolous in the house of mourning, and will never deserve his high calling if he does not realize and express his appreciation of the situation. He must learn these things for himself; no books can teach him. He must realize how much depends upon his words and presence. His conclusion was a beautiful appeal to the class to remember the higher side of the profession, and to cultivate a tender heart.

The exercises then closed with the benediction by Dr. Mathews.

At a later hour the Board of Regents, faculty, graduates, students of the University, and a large number of invited guests met at Morton's, where a generous feast was enjoyed by all. The toasts and speeches were continued until after midnight.

KANSAS CITY HOSPITAL COLLEGE.

The First Annual Commencement exercises of the Kansas City Hospital College were held March 15th in the Unitarian Church. The house was well filled and great interest was manifested in the proceedings. After the overture "Silver Bells" by the orchestra, Dr. D. E. Dickerson, the dean of the faculty, took the chair. Dr. Bowker then prayed for the blessing of God upon all liberal ideas and institutions. After the prayer the orchestra played the march from "Stradella."

The dean presented the diplomas to the graduating class and congratulated them upon their success in passing the severe examination to which they had been subjected. There were eighteen matriculants and seven graduates. The names and residences of the latter are as follows:

Charles F. Kuechler, Edwin G. Granville, William H. Kimberlin, James Carpenter, Kansas City; James Gilbert, Jackson County; Joseph H. Robinson, Tennessee; Rawson Arnold, Oakland, Cal.

Mr. Edwin G. Granville then delivered the valedictory address, which was in substance as given below.

LADIES AND GENTLEMEN.—In universities and colleges, says Lord Bacon, "Men's studies are almost confined to certain authors from which if any dissenteth, it is enough to make him be thought a person turbulent."

That this is true no one can successfully deny. Weak and bigoted men always gratify their vanity in opposing the introduction of additions to our knowledge, which not being taught in the schools in which they were educated, are consequently above their comprehension. The concurrent denunciations of medical theories and practices by many of the enlightened professors and practitioners of medicine in modern times, and the innumerable failures of the practice, proves that medicine as it has been generally taught, understood and practiced, is not what it should be—is not an adequate supply to the demand of the age.

The ancients endeavored to elevate physic to the dignity of a science, but failed. The moderns, with more success, have endeavored to reduce it to the level of a trade. Science has heaped wealth in the lap of commerce; to the healing art, she has been a meagre patron. The commercial man cordially receives her magnificent contributions; the medical devotee looks with jealous eye upon her beneficent discoveries.

Their so-called regular State and County societies are not combinations to advance medical knowledge, for no one who happens to have mastered methods of practice unknown to these associations, essentially different from their methods, could bring any discovery or demonstration before them without being insulted or rejected without a hearing.

The new must e'er supplant the old,
While time's increasing current flows,

Only new beauties to unfold,
And brighter glories to disclose;
For every crumbling altar stone
That falls upon the way of time,
Eternal wisdom has o'erthrown,
To build a temple more sublime.

The cry for more liberality in medical education has continued so long that it has become one of the demands of the age. And to Kansas City belongs the honor of establishing the first college of medicine as an adequate supply to imperative demand—one in which all approved systems are united, and in which all remedial agents are weighed in the scales of utility, and admitted or rejected according to their merits.

Fellow graduates, we are now by the authority of the State of Missouri and the judgment of this faculty Doctors in medicine. It now becomes us, through application and fidelity to our profession, to secure the recognition and patronage of the public, to whom we pledge our most earnest and conscientious efforts. Let us so live and work that when our service here is done, the sentence shall follow: "Well done, good and faithful servant."

At the conclusion of the valedictory, the dean introduced the Rev. John E. Roberts, who spoke upon

SENTIMENT AND SCIENCE.

LADIES AND GENTLEMEN.—Sentiment is thought plus feeling; science is unimpassioned thought; sentiment is the child of the brain and the heart; science is the offspring of the brain; sentiment is ardent, sanguine, buoyant; science is frigid, formal, sedate; sentiment is elastic, roseate and joyous; science is rigid, colorless and solemn; sentiment is eager, impetuous and daring; science is methodical, slow and cautious; sentiment delights in results; science delights in processes; sentiment gathers flowers; science collects bulbs and roots; sentiment thinks science too slow; science thinks sentiment too fast; sentiment sometimes goes wrong; science—ditto.

Sentiment and science sometimes call each other names—then both have got wrong. I want to show you that there is not only room for both sentiment and science in the wide field that lies before us as students, but that the work of each will be imperfect and incomplete without the aid of the other.

The scientific method is not new. It dates, in fact, from before the beginning of the Christian era, but the great thinker who first defined it thought vastly in advance of his age. He was, therefore, destined to be misunderstood and unappreciated for centuries. There came one at last whose intellectual endowments added him to the list of which Aristotle was the last, and now for two centuries and a half the inductive method has been the process by which facts have been treated and scientific conclusions reached.

Following this method the workers of the world—each in his own chosen

field—have been patiently observing and arranging facts. Beneath the disguise of endless variety they have detected hints of unity. Conversant with the "unbounded nature and unitability of particulars," they have drawn nearer and nearer to the subjects that are general and invariable, until, flushed with success and bewildered by the vastness of their deductions, they have invaded almost every realm of thought and emotion, and that, too, in the name of the inductive method.

There is a dogmatic positiveness too often displayed by scientific teachers—that is on the one hand unhealthful to real knowledge and on the other unwarrantably presumptuous. The results of this dogmatism are pernicious to the last degree. It drives the man who accepts its authority as final to the bitter conclusions that the universe is an eternal machine and himself a transient and insignificant part of it.

To him "nature conceals God, for through her whole domain nature reveals only fate—only an indissoluble chain of mere efficient causes without beginning and without end, excluding with equal necessity, both providence and chance. An independent agency, a free original commencement within her sphere and proceeding from her powers is absolutely impossible. Working without will, she takes counsel neither of the good nor of the beautiful, creating nothing, she casts up from her dark abyss only eternal transformations of herself unconsciously and without an end, farthering with the same ceaseless industry decline and increase, death and life, never producing what alone is of God and what supposes liberty, the virtuous, the immortal."

Reacting from this soulless materialism, some have reached the other extreme. Denying to science the claim of authority which she sets up for herself, they have lapsed into a sentimental mood, in which unsubstantial imaginings, unsupported by demonstrations or unwarranted by analogy, are vested with supreme authority. This is intellectual lawlessness. Under this order of things diseased imaginations have no check. The grotesque creations of unbalanced minds possess equal authority with the carefully proved deductions from observed facts—the hope of unity and harmony is blotted out—the world of matter becomes chaos again and the world of mind a pandemonium.

There is ample room for the careful student between these two extremes. He may accord to science all she can justly claim and yet be unfettered. He may also take counsel of his hope and aspiration concerning the realm in which science can gather no facts for demonstration, and still give no offense to reason nor presume upon analogy.

It becomes us to treat all demonstrated truths with reverence and honesty. It also becomes us to discriminate between proof and assumption, between fact and hypothesis, between certitude and probability. It is susceptible of demonstration that the majority of the conclusions reached by science are as yet only strong probabilities. What are popularly regarded as facts are in many instances regarded by the specialists as simply hypotheses. It is strangely true that the unscientific, dogmatic spirit of science is not entertained by the great teachers,

but is the result of hasty conclusions and sweeping generalizations made by the masses.

The people ought to remember what the faithful investigator cannot forget, that science is yet largely tentative and hypothetical, and that her best established conclusions are only strong probabilities.

A recent English scholar has expressed his conviction, "That before a vigorous logical scrutiny the reign of law will prove to be an unverified hypothesis, the uniformity of nature an ambiguous expression and the certainty of our scientific inferences to a great extent a delusion."

The value of science is, of course, very high, while the conclusions are kept well within the limits of the data upon which they are founded, but it is pointed out that our experience is of the most limited character, compared with what there is to learn, while our mental powers seem to fall infinitely short of the task of comprehending and explaining fully the nature of any one object. "Ours must be a truly positive philosophy, but that a false negative philosophy, which, building on a few material facts, presumes to assert that it has compassed the bounds of existence, while it nevertheless ignores the most unquestionable phenomena of the human mind and feelings." This writer defines a law of nature not as an uniformity which must be obeyed by all objects, but "merely an uniformity which is as a matter of fact obeyed by those objects which have come beneath our observation," and adds that it would not be incompatible with logic nor any reproach to our scientific method if objects were discovered which should prove exceptions to any law of nature.

It is not my purpose to awaken unreasonable doubt where certainty may be had, but I want to suggest the propriety of caution and candor, the distinguishing traits of the real student in whatever field. As the domain of knowledge widens man discovers with an ever increasing degree of probability that no one branch of science is independent of all or any of the others and that no one of them all can be rightly understood without taking account of its relations to the rest.

The too exclusive study of a single subject leads to an over confident and dogmatic spirit, to unjust and harmful discriminations. The labor of specialists is, it is true, enriching the world with its results—but the labor of many specialists—not one

There is a large amount of conceit in the reputed dying statement of a certain German student, regretting that he had not devoted his entire life to the single letter "Iota." But the world would have been little better for his "Iota," if others had not studied the rest of the Greek letters and all of the cases. In the better mood of our age no department of learning will say to any other "I have no need of thee." Each acknowledges to every other its peculiar domain and its peculiar importance, and each in its own way points onward to a more complete understanding of man, "the proper study of mankind."

This institution, in observance of whose first annual Commencement we have gathered here to-night, is founded upon this principle of comparative study. It seeks to apply the general principle to the special department of medical science.

It is to be both congratulated and commiserated. The first because it strives to exhibit the broad principles of fraternity and to make common cause for the common good; the second because by virtue of its advanced position it has immolated itself upon the pale of obloquy; it has executed its own irrevocable degree of ostracism.

The constituents of this, its first class of graduates, will go down to their chosen work as Ishmaelites. "Treat such men as gentlemen if you know them to be gentlemen," said a respected physician at a recent Commencement of another school, "but have nothing to do with them professionally."

Such sentiments as that may be necessary to the preservation of some ancient code of professional ethics, but the common people, untrained in the discrimination of such hypercritical refinements can discover neither necessity nor justice for such unwholesome teaching.

Without assumption, I think I may say to the members of this class that the position you will occupy as the first representatives of this college demands of you in a peculiar way the virtues of modesty and forbearance.

By following the curriculum and receiving diplomas from a school that does not acknowledge the supreme and all sufficient authority of any one principle or formula, you stand committed to a practice that must be variable without being fickle and persistent without being inflexible.

Persuaded that the last word has not been said in this nor in any other science you must be listeners. Persuaded that the sum of human knowledge is yet incomplete, you will be patient learners. Francis Bacon compared himself to the statues of Mercury, which indicate the way although they do not pass over it themselves.

Every true student, even in this age, does best who can, when his task is done, point, not to the finished work his hand and brain have wrought, but to the work suggested—perhaps begun—but quite too large for one life to compass. To him who is willing to learn the world has much to teach. To him who listens well there are many voices.

Modesty then is the virtue I would commend, the modesty that makes men teachable, the modesty that keeps the greatest learning humble, the modesty that gives one respect for every man's doubt and a far greater respect for every man's honest belief. By the virtue of forbearance I mean that equable temper born of confidence in one's mission that renders him calm and silent under the stinging lash of criticism, ridicule and obloquy. The world moves slowly, but it moves. When any man leaves the beaten track to make for himself and others a new way—albeit that way leads out by flowers and singing brooks—he brings upon his devoted head storm after storm of bitterness. In other ages the rack and the stake were the rewards that grateful people meted out to the men who thought differently from their times. More than many times have God's rivers been called upon to bear out to the everlasting sea the ashes of God's best interpreters and humanity's best friends.

The method has changed. The spirit remains. Persecution has been refin-

ed to indifference and contempt, but it is persecution still. Some one has said and said wisely that "only he is great who can bide his time." Justice is sometimes tardy, but it comes at last. It will devolve upon you to compel respect for your position by your calmness, your patience and your dignity, to be liberal without being illiberal—to be honest, conscientious and to wait. It will not be fair to conclude that all who criticise are unworthy men.

Bear in mind that this is yet only an experiment, and that many faithful and good men honestly believe it both impracticable and absurd. One of the most dangerous enemies that this movement will encounter will be found in the man of little brain and less conscience who will make it a means to obtain for himself the cheap notoriety of sensationalism or to invest his quackery with respectability. The best thing may be put to the worst use.

If through these things you are able to hold your way, unvexed by honest criticism, unangered by dishonest pretenders, then you will have done more than much toward breaking away from unhealthful technical restraints and in teaching men so.

The world is wide and full of ignorance, want and pain. Superstition casts its weird shadows over the cold, unlighted hearthstones of reason. Despair puts out the torch of hope. The dew falls nightly on new made graves. Whatever his special calling, the true man will find a field wider than his profession. He will need knowledge that no curriculum gives, medicine that no text book suggests, remedies that no formula supplies. Only as his heart is touched with the deeper tenderness and filled with the sublimer sympathies; only as he rises above the formalities and literalism of mere profession; only as he is truly man, will he be able really to help men, and in helping bring himself and them into wider liberty, into clearer light and nearer God.

Rev. Dr. Bowker next addressed the class, giving them timely warning of the difficulties which must beset their paths during professional life. At the conclusion of his remarks Rev. Mr. Roberts pronounced the benediction.

METEOROLOGY.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The extreme cold weather which closed our last report (Jan. 20th,) has continued through the first two decades here recorded. There have been two periods of extremely low temperature, the first lasting from January 18th to Jan-

uary 24th, and the second from February 1st to February 9th. The temperature reached −21° on January 22d and February 4th.

During the storm of February 15th the lowest barometric pressure was reached—as observed 28.460, reduced to zero and sea level 29.395.

The highest temperature was 65°, February 14th.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	Jan. 20th to 30th.	Feb. 1st to 10th.	Feb. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	2.3	−3.9	19.2	. .
Max	32.0	19.3	47.2	. .
Min. and Max	17.1	7.4	33.3	. .
Range	30.3	25.4	28.0	. .
TRI-DAILY OBSERVATIONS.				
7 a. m.	10.0	24.1	24.1	. .
2 p. m.	26.6	38.7	38.7	. .
9 p. m.	18.0	31.1	31.3	. .
Mean	18.2	30.1	31.1	. .
RELATIVE HUMIDITY.				
7. a. m.	. .	. .	. .	. .
2 p. m.	. .	. .	. .	. .
9 p. m.	. .	. .	. .	. .
Mean	. .	. .	. .	. .
PRESSURE AS OBSERVED.				
7 a. m.	29.17	29.41	29 28	. .
2 p. m.	29.17	29.38	29.19	.
9 p. m.	29.20	29.43	29.21	. .
Mean	29.18	29.41	29.23	. .
MILES PER HOUR OF WIND.				
7 a. m.	14.0	14.5	14.9	. .
2 p. m.	10.0	15.7	18.2	. .
9 p. m.	14.0	13.4	17.8	. .
Total miles	3071	2686	3570	9327
CLOUDING BY TENTHS.				
7 a. m.	5.0	6.7	6 5	. .
2 p. m.	3.0	6.0	5.6	. .
9 p. m.	5.0	2.5	4.2	. .
RAIN.				
Inches	0.0	0.20	1.50	1.70

The weather at this station since February 20th, when the above report closed, has been much warmer, and yet there have been but three days when the freezing temperature was not reached. The rainfall has been light but the first decade was very muddy, owing to previous rains and depth of frost.

On the north side of a building, twenty feet distant, there was frost in the ground as late as March 20th. There has been no weather thus far to favor the premature putting forth of fruit buds, and altogether the season is much more backward than usual. In addition to the usual report by decades the following items are given:

Highest temperature, 74°, on March 14th. Lowest temperature, 9°, on March 19th.

Highest pressure, 29.730, reduced 30.654, on March 3d. Lowest pressure, 28660, reduced 29.608, on March 18th.

Greatest velocity of wind, 60 miles, on March 13th.

The usual summary by decades is given below:

TEMPERATURE OF THE AIR.	Feb. 20th to 28th.	Mar. 1st to 10th.	Mar. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	24.4	25.0	24.2	24.5
Max	48.9	55.7	58.5	54 4
Min. and Max	37.2	40.1	41.9	39.7
Range	24.4	28.6	31.4	28.1
TRI-DAILY OBSERVATIONS.				
7 a. m.	28.8	32.4	33.7	31.6
2 p. m.	47.0	51.8	52.1	50.3
9 p. m.	36.9	38.4	38.1	37.8
Mean	37.4	41.5	41.6	40.2
RELATIVE HUMIDITY.				
7 a. m.	. .	. .	. .	. .
2 p. m.	.	. .	.	. .
9 p. m.	. .	. .	. .	. .
Mean	. .	. .	. .	. .
PRESSURE AS OBSERVED.				
7 a. m	29.27	29.27	29.09	29.21
2 p. m.	29.26	29.25	29.06	29.19
9 p. m.	29 24	29.05	29.17	29.15
Mean	29.26	29 24	29.08	29.18
MILES PER HOUR OF WIND.				
7 a. m.	9.2	11.0	14.6	11 5
2 p. m.	16.1	20.0	22.8	19 6
9 p. m.	11.0	12.5	15.4	13.0
Total miles.	2560	3906	4035	10501
CLOUDING BY TENTHS.				
7 a. m.	5.9	4.8	5.7	5.1
2 p. m.	4.0	4.8	1.5	3 4
9 p m	3.5	4.6	2.7	3.6
RAIN.				
Inches.	1.40	0.75	.01	2.16

ARCHÆOLOGY.

AN OLD MAP.

Wm. J. Florence, the actor, has sent to this office from Middletown, Conn., a little pocket-map of Missouri in 1829, which is a curiosity. The leather cover is three inches by two, and the map inside is ten by twelve inches. There are twenty-eight counties in the State—St. Louis, Jefferson, Franklin, Washington, Ste. Genevieve, St. Francis, Perry, Madison, Cape Girardeau, Scott, New Madrid, Gasconade, Cole, Wayne, Cooper, Saline and Lillard south of the Missouri

River, and St. Charles, Lincoln, Montgomery, Pike, Callaway, Ralls, Boone, Howard, Chariton, Ray and Clay north of it.

Wayne is the largest County in the State, Gasconade next, and these two counties embrace two-thirds the area south of the river. Lillard is the only County whose name does not survive in the existing county nomenclature. It embraced area bounded by the Missouri on the north, the Osage on the south, the western border on the west and Saline County on the east, now one of the finest districts in the State. The western border runs in a straight line north and south across the Missouri River at the point where Kansas City now stands. The "Platte purchase," embracing the rich and productive region included between this old border and the Missouri to the Iowa line, had not then been added to the State. This map was published by A. Finley, northeast corner Chestnut and Fourth Sts., Philadelphia, in 1829, and the copy sent to us was picked up by Mr. Florence in Middletown, Conn.—*St. Louis Republican.*

THE DAVENPORT ACADEMY OF SCIENCES.

The Academy of Natural Sciences had last evening, March 5th, an unusually large and interesting meeting.

The Publication Committee reported the completion of the printing of the third part of Volume III of the "Academy Proceedings," and the reception of the engravings; the volume being now ready for binding, which will be done without delay.

The Librarian, Miss Dr. McCowan, reported the addition to the library during the month of thirty-two bound volumes, forty-one pamphlets, thirty-nine circulars and bulletins, thirty-three daily and weekly papers—total, 145; exclusive of the city papers.

The Curator presented for inspection a collection of thirteen of the "curved-base" mound-builders' pipes just received from that indefatigable explorer and collector, Rev. J. Gass. These pipes were collected the past year from the mounds in Muscatine, Rock Island and Mercer Counties, by Mr. Gass, his brother and some neighbors, and he has recently acquired full possession of them for the benefit of the Academy, with a full description of the mounds, their structure, etc., etc.

One of these pipes is a finely carved stag's head, representing the antlers bent around the bowl and carved in relief; another is an eagle, perched, and holding some small animal in its claws, and two others are neatly carved birds. These four are of ash-colored pipe-stoner Another is a finely sculptured black bear and is very appropriately cut in a smooth fine-grained black stone. The sixth is supposed to represent a fox with the face turned backward, carved in a beautiful bright red catlinite; the seventh, a non-descriptive animal is also cut in red catlinite, very much spotted.

Two of plain form, all composed of plain red catlinite. The other four are made of a light brown stone, rather small and of the simplest form.

There is also an "axe" of the exact usual form of the plano-convex copper "axes" so-called, which is also made of the catlinite, or red pipestone, and a small charm of the same material.

This constitutes a very important addition to this already unequaled collection of the relics of the mound-builders and bringing the collection of pipes of this typical form up to the number of fifty-six, including several unfinished specimens, and by far the largest collection of its kind in the world.

Mr. Gass presents these in the name of his little son, and a committee was appointed to draft and present to him resolutions expressive of the heartfelt thanks of the Academy and their high appreciation of his noble, disinterested and self-sacrificing labors for the building up of this magnificent collection of the relics of the remote past of our immediate locality.

It was voted that the Curator, Mr. W. H. Pratt, be requested to prepare a paper on the mound-builders' pipes for the meeting of the American Association for the Advancement of Science, to be held in August at Minneapolis.

H. A. R.

BOOK NOTICES.

HISTORY OF THE NEGRO RACE IN AMERICA. By George W. Williams. In two volumes, octavo, Vol. II.; 1800 to 1880; pp. 611. G. P. Putnams' Sons, New York. For sale by M. H. Dickinson, Kansas City, $3.50.

To those persons who doubt the ability of the colored man to accomplish excellent literary work we commend these volumes of Mr. Williams. He has devoted seven years to their preparation and has produced the best account, in many respects, of the negro race on this continent, of any author who has essayed the task. The arrangement of the various branches of the subject, the selection of the matter, the style of the composition, are all characteristic of education and taste of a high order. Historical work is by no means easily managed so as to convey the facts in an attractive manner, but Mr. Williams has succeeded admirably in maintaining the interest from beginning to ending and at the same time in keeping all the important points in the foreground.

The first volume covers the period from 1619 to 1800, but the second relates to that portion of the history of the race which is by far the most interesting to the reader and important to the negro himself, viz.: from 1800 to the present time, including the fierce political struggle for the restriction or extension of slavery; the anti-slavery agitation movement; the national legislation upon the subject; the John Brown invasion of southern territory; the war for the Union; the

valorous conduct of the colored troops; the emancipation proclamation; the reconstruction measures; the results of emancipation, etc., etc. All this is told in earnest, faithful, truthful, forceful language which carries conviction with it and gives to the reader a full conception of what the nation has gained by the late war aside from the restoration and perpetuation of the Union.

Despite a few inaccuracies of minor importance and some inelegancies of expression, this book will remain a monument to the author's laborious study and marked ability as a writer, while to future students it will be a text-book, full, reliable and accurate. The publishers have put it forth in very handsome and durable shape, as it deserves.

ANNUAL REPORT OF THE CHIEF SIGNAL OFFICER, U. S. A., for the year ending June 30, 1881. Washington; Government Printing Office, 1882. Octavo, pp. 1296.

This very bulky, and inconvenient to handle, volume contains a vast amount of information, much of which has been already published in the "Monthly Weather Review," and much that will be new to most readers. For instance, few, we presume, are aware of the extent of the diffusion of weather forecasts, warnings of anticipated frosts, floods and storms, or of the great practical benefits derived from them by the agricultural, commercial and other industrial interests of the country. Most people are aware that storm signals are shown at principal sea and lakeports for the benefit of shipping interests. Some may know that bulletins for the benefit of farmers are distributed by telegraph and mail, but very few comprehend how widely the system extends and how highly tobacco and cotton growers prize these warnings received. It will doubtless be a surprise to many to learn that in 1881 six thousand six hundred and seventy-two Farmers' Bulletins were distributed daily, being telegraphed at 1 A. M. to centers of distribution in various portions of the United States and there printed and made ready for mailing by the first trains to all points within six hours reach. The Railway Bulletins, sent by coöperation of the various railways of the country with the Signal Office, also cover an immense field and are of the greatest service, not only to the railroad companies themselves in enabling them to prepare for storms, but also to the people along their lines. Ninety-three companies, represented by 2937 telegraphic stations, are volunteering and gratuitously assisting in this service. Boards of Trade, Chambers of Commerce and other commercial organizations throughout the country take an active interest in assisting in procuring and disseminating these daily reports. The planters in the cotton region have demanded and received similar bulletins from a large number of stations all through the belt; the prominent newspapers of the larger cities have found it beneficial to their readers to publish the daily meteorological charts and data; the river men have been furnished warnings regarding freshets, ice-gorges, etc.; the cultivators of sugar-cane (as well as those of cotton and tobacco) have received frost warnings which have enabled them to guard against injury to their crops. The orange

interests of Florida and the fruit interests in other sections have also been largely benefited by these warnings. The correctness of these warnings and storm predictions have been carefully verified by observations and found to agree very closely with the actual results, the percentage of accuracy running as high as 95 on the average.

There is no question of the value and importance of the Signal Service work to the country at large, and the number of persons consulting the charts and tables in our post-offices, daily, shows the confidence placed in the observations and predictions by the public generally.

THE BUILDERS' GUIDE. By Fred. T. Hodgson; 12mo. pp. 326; New York. The Industrial Publication Society, 1882. $1.00.

This work is chiefly intended as an aid to the builder and contractor in making estimates of the cost of work they may be competing for. The author is editor of the *Builder and Woodworker* and is fully competent to offer advice and information on all branches of the builder's business. In addition to the ordinary rules for estimating found in such books, he has given prices of material, labor, tools, etc , which, if not applicable at all localities, will serve as a general guide at least to proportional values and enable the mechanic to avoid the reckless guessing which so often appears in their bids.

Many pages are devoted to valuable tables and memoranda of a useful character compiled from the standard works of Nicholson, Barlowe, Rankine, Trautwine and other well known authors, also to various rules and recipes that must prove of service to builders and all others interested in the construction, repairs or decoration of buildings. A very concise summary of the Mechanic's Lien laws of most of the States of the Union is given which adds largely to the value of the work to laboring men and those supplying materials. Nearly sixty pages are devoted to a glossary of architectural terms, and the whole is concluded with a careful index. Apparently it is just the book needed by estimators, contractors and mechanics.

REPORT OF THE DIRECTOR OF THE U. S. GEOLOGICAL SURVEY, 1881. Quarto, pp. 588. U S. Printing Office, Washington, 1882.

This is the Second Annual Report of the Survey and is made by Major J. W. Powell, the capable successor of Mr. Clarence King, who resigned March 11, 1881. It comprises a general account of the work done, with the administrative reports of the several assistants and several valuable accompanying papers, such as The Physical Geology of the Grand Cañon District, by Captain C. E. Dutton; Contributions to the History of Lake Bonneville, by G. K. Gilbert; Abstract of Report on Geology and Mining Industry of Leadville, by S. F. Emmons; A Summary of the Geology of the Comstock Lode and the Washoe District, by Geo. F. Becker; Production of the Precious Metals in the United States, by Clarence

King; A New Method of Measuring Heights by Means of the Barometer, by G. K. Gilbert. List of illustrations.

The volume is admirably printed and, as can be seen by the above statement of its contents, it is an exceedingly valuable work. The expenses of the Survey for the year were $156,000.

GEOMETRY AND FAITH. Thomas Hill, D. D.; 12mo., pp. 124. Lee & Shepard, Boston, 1882. $1.25.

The Rev. Dr. Thomas Hill, who was at one time President of Harvard College and who was regarded by the late Professor Peirce as one of the finest mathematicians of this country, has again rewritten and sent forth his little work with the above title. It was first published in 1852 as a supplement to Charles Babbage's "Ninth Bridgewater Treatise," and with the same object in view, i. e. to refute the idea that ardent devotion to mathematic studies is unfavorable to faith, and also to indicate the aid which the evidences of Christianity may receive from such studies. It is admirably adapted to such a purpose, inasmuch as it combines precise mathematical statements with the imagination of the poet, the eloquence of the orator and the learning of the sage. Very few can read the several chapters of the work and fail to be convinced that there are "proofs of a divine intelligence behind and beneath the order of nature, manifest alike in the grandest and minutest forms, alike in the most abstract and the most concrete laws of the universe." He applies the strictest mathematical tests to the processes and results of nature, and shows beyond question the rule of law as formulated and operated by a prime originator and Creator. It is just such a work as a lover of the higher mathematics would be attracted by, and at the same time it is extremely fascinating to any reader.

Doctor Hill is also an eminent Hebrew scholar and has devoted some of his leisure hours to the translation of the Old Testament scriptures and the books of Apochrypha. He has now in hand a translation of Ecclesiasticus, which he regards as "a grand old book, fully worthy (as far as I can see) to take its place by the side of the Proverbs."

OTHER PUBLICATIONS RECEIVED.

Missouri Historical Society, annual address of the President, Geo. E. Leighton, January 16, 1883. Proceedings of the Academy of Natural Sciences of Philadelphia, Part III, October to December, 1882. Capital and Labor, Henry McKinney, Great Bend, Penn., 10c. Discussions in Current Science, by W. Mattieu Williams, *Humboldt Library*, No. 41, 15c. Bromide of Ethyl, by Julian J. Chisolm, M. D. Cambridge Entomological Club, Annual Report for 1882. The Researches of Colorado, 1881 and 1882, J. Alden Smith, State Geologist, pp. 160, 35c. Annual Report of the Board of Health of Kansas City for the

the year 1882, by John Fee, City Physician. *The New Idea*, weekly, Frank H. Fenno, Altay, N. Y., $1.00 per year. The Eclectic Magazine, February, 1883, monthly, E. R. Pelton, Publisher, $5.00 per annum. The British Quarterly Review, the Leonard Scott Publishing Co., N. Y., $2.50 per annum. The History of the Science of Politics, by Fred Pollock, *Humboldt Library*, No. 42, 15c. On Some Enclosures in Muscovite, by H. Carvill Lewis.

SCIENTIFIC MISCELLANY.

THE BACON-SHAKESPEARE CRAZE.

RICHARD GRANT WHITE.

And now we are face to face with what is, after all, the great inherent absurdity (as distinguished from evidence and external conditions) of this fantastical notion,—the unlikeness of Bacon's mind and of his style to those of the writer of the plays. Among all the men of that brilliant period who stand forth in the blaze of its light with sufficient distinction for us, at this time, to know anything of them, no two were so elementally unlike in their mental and moral traits and in their literary habits as Francis Bacon and William Shakespeare; and each of them stamped his individuality unmistakably upon his work. Both were thinkers of the highest order; both, what we somewhat loosely call philosophers: but how different their philosophy, how divergent their ways of thought, and how notably unlike their modes of expression!

Bacon, a cautious observer and investigator, ever looking at men and things through the dry light of cool reason; Shakespeare, glowing with instant inspiration, seeing by intuition the thing before him, outside and inside, body and spirit, as it was, yet moulding it as it was to his immediate need,—finding in it merely an occasion of present thought, and regardless of it, except as a stimulus to his fancy and his imagination: Bacon, a logician; Shakespeare, one who set logic at naught and soared upon wings, compared with which syllogisms are crutches: Bacon, who sought, in the phrase of Saul of Tarsus,—that Shakespeare of Christianity,—to prove all things, and to hold fast that which is good; Shakespeare, one who like Saul, loosed upon the world winged phrases, but who recked not his own rede, proved nothing, and held fast both to good and evil, delighting in his Falstaff as much as he delighted in his Imogen: Bacon, in his writing, the most self-asserting of men; Shakespeare, one who, when he wrote, did not seem to have a self: Bacon, the most cautious and painstaking, the most consistent and exact, of writers; Shakespeare, the most heedless, the most inconsistent, the most inexact, of all writers who have risen to fame: Bacon, sweet sometimes, sound always, but dry, stiff, and formal; Shakespeare, unsavory sometimes, but

oftenest breathing perfume from Paradise, grand, large, free, flowing, flexible, unconscious, and incapable of formality: Bacon, precise and reserved in expression; Shakespeare, a player and quibbler with words, and swept away by his own verbal conceits into intellectual paradox, and almost into moral obliquity: Bacon, without humor; Shakespeare's smiling lips the mouthpiece of humor for all human kind: Bacon, looking at the world before him and at the teaching of past ages with a single eye to his theories and his individual purposes: Shakespeare, finding in the wisdom and the folly, the woes and the pleasures of the past and the present only the means of giving pleasure to others and getting money for himself, and rising to his height as a poet and a moral teacher only by his sensitive intellectual sympathy with all the needs and joys and sorrows of humanity: Bacon, shrinking from a generalization even in morals: Shakespeare, ever moralizing, and dealing even with individual men and particular things in their general relations: both worldly-wise, both men of the world, and both these master intellects of the Christian era were worldly-minded men in the thorough Bunyan sense of the term: but the one using his knowledge of men and things critically in philosophy and in affairs: the other, his synthetically, as a creative artist: Bacon, a highly trained mind, and showing his training at every step of his cautious, steady march: Shakespeare wholly untrained, and showing his want of training even in the highest reach of his soaring flight: Bacon, utterly without the poetic faculty even in a secondary degree, as is most apparent when he desires to show the contrary: Shakespeare, rising with unconscious effort to the highest heaven of poetry ever reached by the human mind. To suppose that one of these men did his own work and also the work of the other is to assume two miracles for the sake of proving one absurdity.—*Atlantic Monthly for April.*

THE TOTAL SOLAR ECLIPSE OF MAY 6TH.

A total eclipse of the Sun occurs on the 6th of May. The Sun and Moon, the chief actors in the grand display, regardless of the convenience of terrestrial observers, have located the scene of operations in the Southern Pacific Ocean. The line of totality sweeps over a vast extent of watery waste, including in its passage only two small islands, where the eclipse can be seen to advantage. These two islands are Caroline Island and Flint Island. The former is about ten miles in circumference, and is inhabited by thirty natives of the Malay race and one white man. The latter is five or six miles in circumference, and is, we believe, uninhabited. Both islands are out of the beaten track of those who go down to the sea in ships. But small as the islands are, and difficult as they are to reach, the wise men who wish to study the eclipse, and all others who desire to witness the most glorious celestial phenomenon that ever takes place, will have to congregate on these two little islands. Thousands of miles of ocean must be traversed, and all manner of privations and hardships must be endured, in order to behold the awe-inspiring spectacle. But never yet in the history of the human

race have any difficulties in the way prevented zealous men of science from attempting to fathom the mysteries that enshroud our celestial neighbors.

Two French expeditions are being equipped, one to observe the eclipse at Caroline Island and the other at Flint Island. The British nation will not allow their neighbors across the channel to outdo them in scientific research, and will, doubtless, send an observing party to Caroline Island. The Americans are now strongly agitating the question of sending some of the best astronomers to the same fortunate island, and there is little doubt that the means will be forthcoming. Amateur astronomers are debating the question of joining the expedition, and the prospect is that when the 6th of May dawns a colony of scientists, from many quarters of the globe, will be assembled in this lone land of the Pacific to find out what secrets they can discover while the face of his majesty, the Sun, is veiled from mortal view.

The eclipse of May next is especially favorable for observation on account of the long duration of totality, which will amount in some localities to nearly six minutes. The longest time that a total solar eclipse can last is not quite seven minutes. The eclipse observed last year in Egypt lasted only seventy-two seconds, and it is a rare event for an eclipse to last nearly six minutes, as will be the case with the coming eclipse. Caroline Island is situated in 73° 20′ W. longitude from Washington, and 9° 40′ S. latitude. The duration of totality there will be five minutes and twenty seconds. Flint Island is situated in 73° 40′ W. Longitude from Washington, and in 11° 30′ S. latitude. The duration of totality there will be five minutes and thirty-three seconds.

The approaching eclipse is therefore a very important one, on account of the unusually long continuance of the total phase; for the law is, the longer the totality the more favorable are the conditions for observation. Astronomers will do their best to increase their stock of knowledge on three important points, two of which are connected with the surroundings of the Sun, never revealed except on the rare occasions of a total solar eclipse. They hope in the first place to add something to what has already been learned during previous eclipses concerning the corona, especially in regard to the immense appendages which branch out from the corona in all directions; to find out whether they are dependencies of the coronal atmosphere, or whether they are swarms of meteors circulating around the Sun. In the second place, they will make a study of the zodiacal light and its relation to the Sun's surroundings In the third place, they will carefully search for the small intra-Mercurial planets that probably circulate in the immediate neighborhood of the Sun, and which can only be seen when making a transit over his disk or during a total solar eclipse. The spectroscopist, the photographer, and the observers with the naked eye will do their allotted parts in the difficult and delicate work. The tropical locality of the places of observation is favorable for clear weather on the momentous occasion, and there is reason to hope that discoveries will be made and observations confirmed that will render illustrious the astronomical annals of 1883.—*Providence Journal.*

EDITORIAL NOTES.

THE present number concludes the sixth volume of the REVIEW, and again we tender our thanks to our subscribers for their support and their frequently expressed appreciation of our efforts to instruct and entertain them. We are also indebted to our contributors for their unremunerated assistance in maintaining the character of the REVIEW for originality and ability. We have at all times endeavored to give prominence to Western discoveries, inventions and theories, and upon looking over the back numbers we are quite surprised at the extent and value of this kind of matter we have secured and given to the public. Not less than 1,200 pages have been written by Missouri contributors and devoted to the material interests of this State; nearly 1,000 by Kansas writers upon subjects connected with the advancement of the scientific and commercial interests of that State and nearly 500 by scientists of Colorado upon her mining and metallurgical interests. All of the other Western States have been represented by original articles upon industrial or other important practical subjects, while the Central and even the Eastern States have been frequently heard from through their best thinkers and writers.

The REVIEW has succeeded in gaining a standing among the standard periodicals of the country, which is highly creditable both to the community whence its principal support comes and to the character of the articles published.

It is, however, again necessary and proper to call the attention of the friends of popular science and education to the fact that the REVIEW is not even yet upon a self supporting basis, and to ask their aid in establishing it on so firm a footing that the tax upon its editor and publisher will only fall upon his time and energies, and not upon his pocket also, as heretofore. The magazine is one of the recognized factors in the general advancement of this region and consequently deserves the support of all classes of citizens.

THE Kansas City Academy of Science has given its regular monthly entertainments during the past winter, which have in most cases been fairly attended. The lecture by Rev. Doctor C. L. Thompson upon "The Science of Religion" was repeated by request on the last Tuesday of February and was enthusiastically received. That of Professor George Halley, M. D., upon "Prisons and Prisoners," owing to the threatening weather and the multiplicity of other entertainments on last Tuesday, was postponed until a more favorable occasion. The writer hereof has had the privilege of hearing a great portion of it read and can testify to its originality and worth. There will be two more meetings this spring—the last Tuesdays of April and May respectively. The latter named evening is the occasion of the Eighth Anniversary of the Academy, when an address by the President upon the progress of Science may be expected.

PROF. F. F. HILDER, of St. Louis, recently delivered a lecture before the Davenport (Iowa) Academy of Sciences upon "The Art Wonders of Ancient Egypt." As Professor Hilder spent several years as a civil engineer and interpreter in the service of the Egyptian Government, his opportunities for acquiring intimate knowledge of his subject were exceptionally good and the lecture was largely attended.

THE mistake of 1000 years in our statement of Wiggins' prophecy in the March REVIEW, though made without collusion with him, will probably, in view of the results March 9th to 11th, be regarded by him as a saving clause, and will be adopted as the true text by his adherents.

IT is probable that Prof. W. I. Marshall, who delivered an illustrated lecture at the Opera House upon "The National Park and its Great Geysers," under the auspices of the Kansas City Academy of Sciences three years ago, will be induced to visit the city in May and give a series of entertainments illustrated by stereopticon views of the wonders of the Pacific Coast. If the Academy succeeds in this our citizens can prepare for a rich treat.

MR. T. CUMMINGS, in the *Scientific American* claims to have discovered that the Egyptian obelisk in Central Park is not granite, as has been supposed, but simply a concrete composed of crushed granite, asphalt and hydraulic lime (not cement). He gives the Egyptians great credit for knowing how to make first-class concrete, but offers to duplicate the obelisk in the same material for $15,000. If history is correct as to the age of this job, Mr. Cummings would have to employ a longer lived insurance company than ordinary to furnish a satisfactory guaranty of the durability of this duplicate.

THE transportation car of U. S. Fish Commission, in charge of Mr. Moore, remained here a few days last week, affording quite a number of our citizens an opportunity to inspect it and the manner of handling the young fish. It has been discovered by experience that if the water containing them is kept at about 40° it is not necessary to change it more than twice a week, even when there are twenty or thirty fishes to the gallon.

A coal mine has been discovered in the vicinity of Gentryville, Mo., and a company is being organized to develop it. The vein is about three feet thick, and the coal is said to be of good quality.

A slight shock of earthquake was felt all along the Pacific coast east and south of San Francisco, on the 30th of March. At Watsonville nine shocks were felt, and at Hollister plate-glass windows were broken and brick walls cracked.

MR. KEELY, the inventor of the motor which he claims will revolutionize all motive power, proposes to make a trial trip on the 4th of July. The apparatus will have a capacity of 500-horse power. The parts of the engine are massive, and are composed of Austrian gun metal and the hardest of hardened steel.

THE fourth centennial anniversary of the birth of Raphael was celebrated at Rome, March 18th, with great pomp. A bronze bust of the great artist was unveiled at his tomb.

DR. LEWIS SWIFT, Director of the Warner Observatory, has received from Minister Morton at Paris 540 francs, the Lalande prize of the Paris Academy of Science awarded each year to the astronomer most distinguished during the year. The prize also includes a silver medal of the Institute of Paris, of which Dr. Swift becomes an honorary member.

THE Annual Reports of the City Comptroller, City Engineer and City Physician are the fullest, most complete and most satisfactory of any ever made by similar officers in the history of this city. We shall take occasion to quote from the last named in our next.

SENATOR BRYANT'S bill appropriating $100,000 for enlarging and repairing the State University of Missouri passed the Senate on March 23d, and has since been approved by the Governor.

A new test for gold leaf was accidentally discovered at the Farrell Venetian Art Glass Manufacturing Company's works in Brooklyn. By the Farrell process the leaf is placed on the incandescent glass, which is then blown. The expansion splits the leaf into beautiful and fantastic forms, and the object is then fired, covering the glass with the vitreous material. In using a guaranteed 999 quality of gold leaf the workmen found that the expansion separated the gold from a copper alloy, and the object was ornamented with gold

and handsome green, the latter color being due to the oxidation of the copper.

THE U. S. Signal Officer, at St. Louis, predicts that the current of the Mississippi River will cut its way into the Atchafalaya Bayou within a year or two and make that the main channel from the mouth of the Red River to the Gulf. This will shorten the line to the Gulf about 200 miles, but as the cities along the present course and Captain Eads will decidedly object to the change, it is likely that such steps as we suggested last season will be adopted to prevent the change and at the same time allow of the overflow in very high water from the Mississippi through the Atchafalaya Bayou to the Gulf and thus save the country below the mouth of the Red River.

THE National Academy of Science will hold its regular annual meeting next month. A larger attendance than usual is anticipated, as the members of the Academy will be invited to participate in the ceremonies attendant upon the unveiling of the statue of the late Prof. Henry, for many years in charge of the Smithsonian Institution. The 19th of April has been selected as the time for the ceremony, and in deference to the simplicity that characterized the life of the deceased, the details of the occasion will not be elaborate, but will consist of an oration by President Noah Porter, of Yale College. The statue is the work of W. W. Story, whom Congress specially named in the law appropriating $15,000 for it. Besides the members of the National Academy, President Arthur and his Cabinet and committees representing Congress, as well as other distinguished persons, will be present. The figure is of bronze, seven feet high, and represents the late Professor standing in a meditative attitude, one hand resting upon a support, the whole effectively and gracefully draped in an academic gown. The pedestal is of red beach granite, and the base and top of Quincy gray granite. The red granite is polished and bears upon its surface, in clear-cut Roman letters, the simple inscription "Joseph Henry."

ITEMS FROM PERIODICALS.

Subscribers to the REVIEW *can be furnished through this office with all the best magazines of the Country and Europe, at a discount of from 15 to 20 per cent off the retail price.*

WE have received *Harper's Monthly* for April, also the latest numbers of the *Weekly* and the *Bazar*. Without entering into details, we cannot avoid calling attention to the constant improvements being made in each of these periodicals, not only in literary matter but in engravings, printing and general style. The editors of these magazines seem to have no idea of ceasing their progressive efforts, though the public have regarded them as nearly perfect for a long time.

WE learn from "Notes and News" in *Science* of March 16th, that the American Archæological Institute of America, at Boston, has about 80 life and 220 annual members, and besides its Reports and its papers, has commenced the publication of a Bulletin giving the full reports of its agents in Greece, New Mexico, Cyprus, the Troad, etc.

THE contents of the *Popular Science Monthly* for April are as follows: Nature and Limits of the Science of Politics, by Professor Sheldon Amos, LL.D. The Economic Function of Vice, by John McElroy. Progress of the Backboned Family, by A. B. Buckley, (Illustrated). Curiosities of Superstition, III, by Felix L. Oswald M. D. Perceptional Insanities, by Dr. W. A. Hammond. Dwarfs and Giants, by M. Delbœuf. The Census and the Forests, by N. H. Egleston. Origin of the Donkey, by C. A. Pietrement. Speculations on the Nature of Matter, by Henry H. Bates, M. A. The Legal Status of Servant Girls, by Oliver E. Lyman. The New York Geological Survey, by James Hall, LL. D. The Origin of the Calendar and Astrology, by Professor W. Foester. Sketch of Increase Allen Lapham, LL. D., (With Portrait); Correspondence; Editor's Table; Literary Notices; Popular Miscellany; Notes.

THE *Art Interchange*, published by William Whitlock and edited by Arthur B. Turnure at 140 Nassau Street, New York, is an admirably conducted periodical. In the number for March 15th we find several most beautiful designs for the use of amateur and art students. Eleven columns are devoted to Notes and Queries upon art topics. Among the subjects considered are—Plaster Casts, Dacca Silk, Easter Church Trimming, Spray Work, Drawn Work, Decoration for Fireplace, Oil Colors for Grapes, Mirror Silvering, Decorations for four sets of Scrym Curtains, Inlaid floors, Text Book on Composition, Painting on Silk and Satin.

All subscribers to the *Art Interchange* are entitled to the privilege of asking advice on topics connected with art, literature, and etiquette. $2.00 per annum.

THE April *Atlantic* opens with the first installment of the dramatization of Henry James's Daisy Miller, with new characters and scenes. This is followed by Pillow-Smoothing Authors, an essay by Dr. Holmes, who furnishes a prelude on Night-Caps, and comments on an old writer, namely, Burton, from whom he makes copious extracts. Charles Dudley Warner contributes a remarkably excellent article on Modern Fiction. Miss Sarah Orne Jewett has a delightfully characteristic New England story entitled A New Parishioner. Richard Grant White contributes an article on the Bacon-Shakespeare Craze. Bradford Torrey, writes for this number an interesting article on Bird-Songs. Elizabeth Robins writes of Stage Buffoons in different countries and times. There are poems by Mr. Aldrich, Rose Hawthorne Lathrop, and others, together with reviews of important recent books, and the usual variety of the Contributors' Club.

IN the *North American Review* for April, the scriptural and legal aspects of Divorce are presented respectively by the Rev. Dr. Theodore D. Woolsey, well known for his insistance on the indissolubility of the marriage tie, and by Judge John A. Jameson, a jurist whose long experience with divorce cases in Chicago, both on the judicial bench and at the bar, lends to his observations a very special value. Dr. P. Bender, under the title A Canadian View of Annexation, makes a forcible presentation of the reasons which incline many citizens of the Dominion to favor the idea of absorption by the United States. Senator John A. Logan sets forth the need which exists for National Aid to Public Schools in the several States and Territories. The Rev. Dr. Howard Crosby writes of The Dangerous Classes that menace the perpetuity of civil order and the peace of the community, meaning the manipulators of corporation stocks and the men who, having amassed enormous wealth, use it for nefarious purposes. James C. Welling, President of Columbian University, treats of Race Education, the problem that confronts the philosophic statesman, of the presence in our body politic of a strong Negro contingent. The Water Supply of Cities is discussed by Charles F. Wingate; Ethic Systems, by Prof. F. H. Hedge; Street Begging, by Rev. Dr. Charles F. Deems, and Criticism Christianity, by O. B. Frothingham. Published at 30 Lafayette Place, New York, and for sale by booksellers generally.

WE are indebted to Prof. C. V. Riley, the U. S. Entomologist, for a copy of Vol. I of the Proceedings of the Biological Society of Washington, containing an account of the Darwin Memorial Meeting, May 12, 1882, with the addresses delivered on the occasion.

Harper's Weekly for March 31st contains an illustrated account of the lacustrine village of St. Malo, at the foot of Lake Borgne, which for fifty years has been occupied by certain Malay fishermen from the Phillipine Islands. The description of the manners and customs of this strange settlement, in which there are no women, is very interesting. Except for the possession of modern firearms and one antiquated clock, the life of the lake dwellers of St. Malo would seem to be about on a parallel with that of the Swiss lacustrine settlements of the Bronze epoch.

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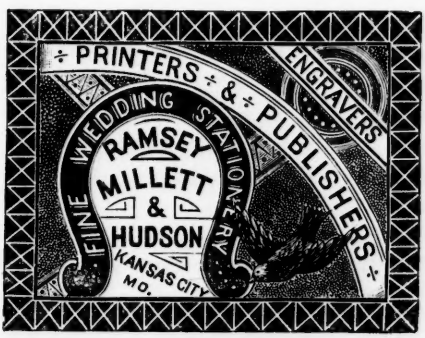

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PROF. E. A. POPENOE, of the Kansas Agricultural College, in remitting, says: "I will speak to my friends in behalf of the REVIEW and hope I may be able to induce some of them to become subscribers."

PROF. H. C. BOLTON, of Trinity College, Hartford, Conn., says: "Your REVIEW contains many valuable papers."

PROF. PAUL SCHWEITZER, of the University of Missouri, says: "I inclose money order for the REVIEW. I am glad you continued to send it. Accept best wishes for its success."

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PROF. F. W. PUTNAM, of the Peabody Museum, Harvard University, sends: "Many thanks for the missing No. 5, Vol. VI, of the REVIEW, which arrived this morning."

MR. WM. DAWSON, the Quaker-Shoemaker-Astronomer, of Spiceland, Ind., in sending in a subscription says: "You have my earnest wishes for the success of the REVIEW. I feel too much interest in it to charge anything for soliciting."

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